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THE GAS JOURNAL

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A Glance at the Contents—

Correspondence Classes.

Letters on this topical problem are published from Mr. E. C. Le Jeune and Mr. Arthur Coe.

Institution of Chemical Engineers.

A selection of questions set in this year's examinations for Associate Membership of the Institution of Chemical Engineers will give our readers an idea of the standard demanded by this Institution.

Street Lighting.

This subject is dealt with in an original manner by Prof. Dr. J. Teichmuller, of the Technical High School at Karlsruhe. He maintains that attention should be paid to five factors: Difference perception; form perception (including keenness of sight); speed of perception; speed of difference perception; and, finally, speed of form perception.

Science and Glassware.

In a paper before the Holophane Conference, held in London on July 7 and 8, Dr. S. English reports an all-round improvement in ordinary glassware, and also certain new developments which may be of interest. In the course of his contribution, the author considers first the visible properties, and then passes on to a consideration of certain invisible properties, of modern illuminating glassware.

Microscopical Examination of Coal.

In a paper before the Manchester District Institution of Gas Engineers, Mr. James Lomax, Paleo-Botanist to the Fuel Research Board, discussed the microscopical examination of coal in relation to the production of gas and coke. This microscopical examination, he says, gives a good idea of what will happen when coal is carbonized. Valuable information is also gained from the study of the coal balls or petrifactions which are found in certain seams, sometimes isolated and sometimes in groups.

Corrosion of Steel Mains.

The first of a series of two articles on this subject, by Messrs. E. E. Jeavons and H. T. Pinnock, is published. Since 1903 the authors have been studying the very important subject of the prevention of corrosion. They observe that, if the simplicity of the facts relating to the prevention of corrosion were appreciated, gas engineers would use more steel mains, not only because there is now no need to fear corrosion, but because of the modern tendency to adopt much higher pressures in mains for ordinary distribution purposes. With the experience of a quarter-of-a-century behind them, the authors are convinced that, with steel mains properly bitumen-coated, laid by experienced people, and earthed, there is now little or no danger from electrolytic corrosion (which is the principal and serious form of corrosion) if their method of procedure is adopted.

Profits Spent on Plant and Income-Tax.

A contributor to our pages to-day suggests that what is needed is a Commission of Inquiry, freed from all political or party bias, which will examine the whole implications of industrial taxation and rating, and chiefly from the angle of how best any modification in the present system will induce industrial recovery.

Prof. Cobb's Institution Paper.

In a reply to the discussion on his paper entitled "The Institution and the University; Teaching and Research," which he read at the annual meeting of the Institution in Leeds last month, Prof. J. W. Cobb observes that the question of tuition by correspondence, as raised by Mr. Blundell, has been discussed during the last few weeks in the Press. It is plain, he states, that members of the staff of a gas undertaking isolated geographically from teaching centres are placed at a disadvantage which should be minimized. It would, however, give an entirely wrong impression of what University training means and can do for a man to pretend that it could be conveyed by correspondence courses. The vital things are personal teaching and influence, laboratory work done with carefully selected apparatus, under skilled supervision, and the contact with teachers and students of allied (and remote) subjects in other departments and in the general University life. None of these can be touched by correspondence, which does something different by entirely different methods.

Even small works have now to determine the calorific value of their gas at frequent intervals. We would remind our readers that they can obtain from the "JOURNAL" Offices the Labour-saving B.Th.U. Calculator which was designed by the late Mr. H. J. Hailstone. This neat device, which is for use in conjunction with the Boys Calorimeter, not only saves time and trouble, but ensures constant accuracy; it eliminates all human error in the otherwise necessary multiplications.

EDITORIAL NOTES

Gas Fires and Summer Heat

THE season for developing the heating load is not when "Dick the Shepherd blows his nail," but when we are "thinking on fantastic Summer's heat." In the past gas undertakings have not infrequently been found wanting in November and December. By post, over the telephone, by personal agitation in the showrooms, demands have arrived from cold and impatient consumers that gas fires be installed. There has been a waiting list; "Sorry, not to-day, not even this week, but we will do our best," has echoed among an overworked staff; and there has been an inevitable tendency to ram fires into place, rather than to fit them neatly and with due regard to the future effect of appropriate fitting. However, let us cast the past aside, benefiting by its experiences, and let us ask ourselves what we are doing in between the Test Matches to win for gas a lasting victory in the serious test of gas *versus* electricity in the heating field.

It may be argued that it is only when the thermometer drops quickly and unmistakably that the average citizen realizes that a gas fire will prevent shivers down the spine. This argument is really an admission of failure on the part of the gas industry to impress upon the public during the "silly season" the potentialities of the gas fire. We know all about these virtues. Yet, in spite of a good deal of Press advertising and other forms of propaganda, it is a fact that there are thousands of people who do not appreciate that the gas fire is, among other things, the healthiest form of heating, is an artistic and a labour-saving medium of heat, and is cheap. The time for expatiating on these virtues is, to use an Americanism, "right now." What are we doing about it?

Electrical Competition

CERTAINLY, "right now," the electricians are running about with coils of flex and small metal structures to which are attached two or more elements. This or that electric heater, they say, can be used anywhere and everywhere; it is portable; it emits no fumes; it is ideal for the flueless room. We will not labour this, for our readers are fully aware of such sales talk. Being aware of it, however, is quite another thing from actively countering an opposition which, in some instances, is definitely against the canons of hygiene. For example, a flueless room is the reverse of the ideal; and there can be no such thing as ideal heating in a flueless room. True, an electric heater emits no fumes, but it does next to nothing to rid the apartment of the products of combustion of those who may be in it. Are we telling the public about this sufficiently frequently and with sufficient force? Whom does the public believe—the speculative builder who is out to save bricks, or the gas industry, which is out to save health, as well as to increase its business?

There is another point. The electricians, "right now," are offering heating appliances on such terms as are calculated to influence the pockets of nearly all classes of the community, and they offer, too, special terms for the current consumed, in order to develop a much coveted load. Competition was never so keen as it is this summer. We are not crying "panic." There is no need for panic. In his paper before the World Power Conference, Mr. T. P. Ridley stated that there are ten million gas fires in use in Great Britain to-day. But we insist that greater effort is required if this number is to be increased, in face of concentrated and growing electrical competition, to the figure to which it could be increased were the public cognisant of what gas heating means. Most of the ten million gas fires which are in use in this country to-day are on hire. This indicates that many facilities are offered to consumers to employ gaseous heating, but it does not indicate that these facilities are universal. If this figure was analyzed, it would surely be found that some undertakings were doing far more than others to foster the heating load. In other words, investigation would show that there is room for improvement, as well as for congratulation on this figure.

Do It Now

THIS improvement can be effected, and it must be effected. We do not need to decry electrical appliances; but we do need to boost gas more fervently, and to back up our propaganda with good workmanship and service. Let us talk about the vice of the flueless room until the public, if needs be out of self-defence, refuse to tolerate any apartment without adequate means of ventilation; let us preach the gospel of ventilation, and demonstrate in the home and in the showroom how the gas fire ventilates as it warms; let us offer our consumers fires on such terms as will prove universally attractive; let us fix these fires with due regard to decorative effect; and let us see that, once installed, they are always in a condition to give good service. We know that many undertakings give this service, just as we know that many undertakings could do better than they are doing. This first-class fitting work, and this rousing of public enthusiasm, needs time. Therefore let us take time by the forelock, and start away now with the gas fire campaign. If it is carried out with plenty of energy, there can be no doubt about the results. Once the gas-fire habit is formed, the consumer wonders how he managed to get along at all without gaseous heating. In a bedroom, for instance, a quarter-of-an-hour's morning comfort, and half-an-hour's evening comfort, throughout the greater part of the year, soon result in the installation of a gas fire in the occasional room. Also, what is equally important, this comfort is every minute building-up the goodwill of the public towards gas.

We feel that much good would be done to the cause of gas heating if our readers would voice the difficulties which they experience in their particular districts, and if they would tell us of the extent and nature of the electrical competition they have to face in this direction, and what means they are adopting to combat it.

John Bull's Shop

WOULD it be correct to assert that the general public desire from the newspapers serious information and recreation in about equal proportions? In individual cases, of course, the proportions vary greatly; and perhaps, striking an average, 50 p.ct. may be a somewhat too generous proportion to allocate to the desire for serious information. This side of the newspapers at the present time is depressing; the lighter side is full of "thrills." But depressing or not, there are certain aspects of the news which the recreative section must not be permitted to eclipse, and the magnitude of the unemployment problem is one of them. It is all very well to talk of "cycles," illustrating the point by reference to what has happened in the past, and to say that things "must" get better. But is what has happened before, under largely different conditions, any criterion of what must come to pass now? Is it not rather the case that, as we are faced at this juncture with problems that have never before presented themselves in a like form, new solutions will have to be found? John Bull, we believe, has still the best shop, but he has not the only one, and he must keep his business-getting methods up to date. There must, it seems, be disagreement as to the best means of doing this, but there can be none as to the need.

With our comparatively small population, the number of unemployed is getting on for the 2 million mark, and—possibly more startling even than this—of the total, coal and cotton together are responsible for 26 p.ct. Coal and cotton! For generations, staple industries of the country. As to the distribution of unemployment, 65 p.ct. is concentrated in the Midlands and North-East and North-West of England, where the coal mining, metal, and textile industries account for this position. Nearly one-half of those who have been engaged in the cotton industry are out of work.

The borrowing powers of the Unemployment Fund

have just been increased from £50,000,000 to £60,000,000, a step which was described by the Parliamentary Secretary to the Ministry of Labour as "regrettable, but inevitable." The inevitability will be understood, when it is mentioned that the weekly outgoings exceed the revenue by £450,000. It is explained that this state of affairs is due to the phenomenal rise in unemployment; an obvious explanation, but one unlikely to bring consolation to anyone concerned. One notes the old, old story about distributing the burden—*i.e.*, the "burden of seeing that justice is done to the unemployed"—in quarters able to bear it; but if things continue as they are now, the finding of these "quarters" may prove not the least of the difficulties to be overcome.

It would be wrong not to point out that to-day almost world-wide depression exists. This is admitted, though there is less unanimity regarding its extent in the respective producing communities. It may be that no radical change is to be anticipated in this country before conditions elsewhere improve; but if John Bull gets his shop in order now, there will be the less likelihood of his being "left at the post" when the time arrives for another start in the race for world trade—or should we say, Empire and world trade?

The New London Gas Agreement

MUCH interest will have been aroused by the announcement in the "JOURNAL" of the agreement which has been drawn up between the South Metropolitan Gas Company and the Commercial Gas Company. Meetings of the stockholders in both Companies have been called for next week, when doubtless detailed explanations will be forthcoming; but we already know that the main object of the agreement is to enable the Commercial Gas Company to have the benefit of any premises, plant, organization, operations, or other facilities of the South Metropolitan Gas Company in relation to the manufacture and sale of gas. It is, indeed, broadly on the same lines as the agreement which was entered into between the South Metropolitan Company and the South Suburban Gas Company in the early part of 1927.

On that occasion, it may be recalled, Dr. Charles Carpenter stated, when explaining the position to the South Metropolitan stockholders, that "one of the advantages "of the arrangement defined in the agreement is that in "all respects the two Companies will go on as they are. "The individuality of each will be preserved, but there "will be an association between the two which will enable "each to help the other. That is the alternative to "merging the two into one undertaking. . . . A proposal "of this kind gives us all the advantages of amalgama-"tion without its disadvantages."

This announcement of a second agreement on similar lines will be regarded as strong evidence of the success of the first.

. . . *With My Little Eye*

THIS month Messrs. Holophane, Ltd., held an international conference of their representatives which was far more than a trade show or a means for publicity. In every sense it was a scientific gathering, and several important and interesting contributions were read at the meeting. Among them was a paper on street lighting by Prof. Dr. J. Teichmuller, of the Technical High School at Karlsruhe, which is published on later pages of our issue to-day.

The author mentions the early controversy, which lasted many years, of horizontal *versus* vertical illumination. One side held that no greater demand could be made on the street lighting than when searching for an object, such as a coin, which had been dropped to the ground, and that, therefore, horizontal illumination was all that mattered; while the other side contended that good vertical illumination was the thing to be aimed at, because nothing was more important. Horizontal illumination was advocated by electrical engineers and vertical illumination by gas experts. Electric light came off best if a given street was judged by its horizontal illumination, while gas light won if the estimate was based on vertical illumination. Then came the controversy of uniformity *versus* lack of uniformity. Without going into any details about this, the fact is plain that the evaluation of illumination was on a physical basis, and not on a physiological foundation.

It is to the latter phase of the problem of good lighting that Dr. Teichmuller calls particular attention. It is because of the eye, he says, that there is a fundamental difference between light technology and all other technologies; the eye explains why light technology, more than other branches of technology, has developed and will continue to develop, by leaps and bounds, in the sense that empiricism has anticipated theoretical consolidation and that theoretical justification is paving the way for further progress. "The unprejudiced human eye, like an "incorruptible judge, has even rendered to light tech-"nology the great service of revealing the errors under "which the expert had laboured for a long time. Fre-"quently the eye refused to recognize as good an illumina-"tion which had been designed and executed according "to the experts' best principles. This fact supplies the "key to the physiological era of lighting technology—"that is to say, to its development of recent years, and "especially does this apply to street lighting."

Dr. Teichmuller maintains that far too much attention has been devoted to the individual features of lighting quality to establish, first and foremost, what significance actually is and ought to be attributed to the concept "quality of street lighting." He believes that too much prominence is given to lighting intensity and uniformity, and to horizontal lighting intensity in particular; and he urges evaluation from the bases of difference perception, form perception, speed of difference perception, and, finally, speed of form perception. We wonder whether the author has visited the gas street lighting installation at Lewisham, and, if so, what he thinks of it.

The New Spirit.

Referring to schemes for rationalizing industry and for bringing a new spirit into industrial life, Mr. Arthur Greenwood (Minister of Health) made the fairly obvious point that all such schemes are going to fail unless this spirit is maintained by constant effort. It is the maintenance of the constant effort that presents the real problem. The need for keeping the employee closely interested in his work remains, while the process of rationalization must often have a tendency to reduce the proportions of the personal element. There is, Mr. Greenwood said, an enormous amount of goodwill on both sides, and a desire to find a way out of the difficulties with a maximum of agreement. What, then, is the solution? Probably Sir David Milne-Watson suggested the best thing when he pointed to the co-partnership principle as one of the means towards solving industrial problems.

Co-Partnership in Gas.

The Industrial Co-Partnership Association publish a table giving particulars of co-partnership and profit-sharing schemes in connection with no less than 56 British Gas Companies. This shows the extent to which the principle has been adopted. The duration of the schemes varies from forty years in the case of the South Metropolitan Company down to one year, thus indicating that the system is still gaining ground. The total number of employees under agreement for co-partnership or profit-sharing is more than 43,000; and the amount of shares and deposits held by them (at market value) on Dec. 31, 1929, was close upon £3,000,000. Here, surely, we have a potent means of maintaining that new spirit in industry which is essential to the success of rationalization.

What Nine Years Show.

The "Co-Partnership Magazine" of the Brighton and Hove General Gas Company shows the extent to which their co-partners have benefited in the nine years which represent the length of existence of that Company's scheme: "The large sum of £64,254 has been allotted by the Company to the fund, while interest and dividends earned by the fund, and paid over by the Company, amount to £18,930. Together a total of £83,184. Surely a matter for reflection to all co-partners—and in nine years only. Another interesting figure is the total

sum at the credit of a co-partner who has not withdrawn any interest or dividends. A passbook showing no less than £114 1s. 6d. is his reward."

Cold Weather and Gas Bills.

At the annual meeting of the Canadian Gas Association last month, Mr. Roy Soderlind, of the Ottawa Gas Company, speaking of central heating by gas, suggested that it would be a good plan if the gas bill for the heating season was split up into seven or eight equal payments, with a final adjustment at the end of the season. The gas company, he observed, would not lose anything by arranging the payments this way, as the bills paid in the early part of the season would overlap and make up for the difference in cost during the cold weather. On the other hand, only two meter readings, one at the beginning and the other at the end of the season, have to be taken, and as a consequence book-keeping would be very much simplified.

A Hundred Years Ago.

The " Evening Standard " for July 6, 1830, contained the following item of news : The South Metropolitan Gas Company are now proceeding with their works in the Old Kent Road. We congratulate the inhabitants of Southwark on the prospect of an adequate gas supply. On the South side of the river at present there is only one gas company against eight on the North side. We see the shares are already at a premium.

PERSONAL

On Thursday of last week, at the annual meeting of the Society of Chemical Industry, Lord BROTHERTON OF WAKEFIELD was presented with the Messel Medal. The Medal is awarded for distinguished services to the chemical industry, and has been previously held by four recipients—Prof. H. E. Armstrong, the late Lord Balfour, the late Lord Leverhulme, and Prof. Milliken.

The Bradford Corporation Gas Committee have appointed Mr. HERBERT RHODES to be Mains Superintendent in succession to the late Mr. C. T. B. Roper. Mr. Rhodes has been Deputy-Superintendent of mains for some years past and during the successive breakdowns of Mr. Roper's health in the past two years or so Mr. Rhodes has carried the bulk of the burden of the work. Since Mr. Roper's death in the spring of this year, he has been acting Superintendent in charge of the mains section. Mr. Rhodes, like Mr. Roper, has for a good many years been an active member of the Yorkshire Junior Gas Association and a keen member of the West Riding of Yorkshire Salesmen's Circle from its inception. In consequence of the re-arrangement of duties involved in Mr. Rhodes' appointment, Mr. S. H. PACKER, Showroom Manager, becomes Showroom Manager and Fittings Superintendent.

There was a very pleasant gathering at the Chief Office of the Sheffield Gas Company on Wednesday evening, July 16, 1930, when an oak bureau was presented to one of the members of the Staff, Mr. ALWYN C. MACHIN, on the occasion of his leaving Sheffield to take up the position of Assistant Chief Clerk to the Oxford and District Gas Company. In the unavoidable absence of Mr. Ralph Halkett, the General Manager and Secretary of the Company, the presentation was made by Mr. W. McCulloch, who, in handing over the gift, congratulated Mr. Machin on his appointment, and referred in eulogistic terms to his 18 years' service with the Sheffield Company. On behalf of his colleagues, he sincerely wished him every success in his new post. Mr. Machin thanked his colleagues for their gift and the kind wishes that accompanied it, and said he would like to take the opportunity of expressing his appreciation of the encouragement and assistance he had at all times received and the experience he had gained while working in the General Manager and Secretary's Office.

Mr. GEORGE YOUNGSON, who has been employed for eleven years in the Peterhead Gas Department, has been appointed Assistant to the Distribution Manager of the Primitiva Gas Company, Buenos Aires.

His many friends will be glad to learn that Mr. A. GREGORY, Manager and Secretary to the Harwich Gas Light and Coke Company, Ltd., has recovered from his recent operation. He thanks all his friends for their kind inquiries.

The Directors of the Eastbourne Gas Company have appointed Mr. SYDNEY E. KNOWLES, F.C.I.S., as Secretary, in the place of Mr. J. S. Garrard, who has recently retired. Mr. Knowles, who is at present Secretary of the Bishop's Stortford, Harlow, and Epping Gas and Electricity Company, will take up his duties on Sept. 1 next.

OBITUARY

LEONARD KÖRTING.

The Gas Industry has lost a wonderful personality by the death in Hanover, on July 9, of Leonard Körting. He was in his ninety-seventh year, and could well claim to be the senior member of the industry, not only in Germany, but in the whole world.

He was born at the Hanover Gas-Works of the Imperial Continental Gas Association, eight years after their completion, and one year after his father had taken over the management. He himself was appointed Assistant Engineer under his father in 1855, and succeeded him as Manager in 1878, a position which he held until his retirement in 1908. As recently as 1927 he was present at the centenary celebrations of the Hanover Gasworkers' Guild, when he addressed the gathering in a speech full of humour, and with the vitality which was his to the end.

In his active years he was always recognized as a leader in the industry, and the full development and general introduction of the producer oven owed a good deal to his forceful advocacy. He was a contributor to the Technical Press on a variety of subjects. He was a member of the German Gas Association for 65 years, having been admitted at the sixth annual meeting in 1865. He was President five times between the years 1896 and 1906. On the occasion of his fifty-years' jubilee as an official of the I.C.G.A., the Bunsen-Pettenkofer tablet of honour was voted to him by the German Association in 1905. To this high mark of esteem was added yet another in the following year, when he was elected Honorary Member of the Association—a title which carries very much greater significance in the German than is customarily attached to the English rendering. No one who was present is likely to forget his last public appearance before the Association, when, at the age of 93, at the 1927 meeting he was conducted to the platform by the third and fourth generations of gas Körtings—his son Ernst, of Berlin (himself an Honorary Member), and his grandson. His voice on that occasion reached every one of the hundreds present, and his words were a lasting inspiration to the German gas industry.

Leonard Körting was laid to rest on July 12 in Hanover, where his whole life had been spent. Homage was paid by the President of the German Gas Association, but the gathering of representatives of a great number of other interests showed that respect and affection were felt far beyond the confines of the gas industry.

The death has occurred at Windyridge, Cedar Park, Stoke Bishop, of Mr. WILLIAM GEORGE WILLIAMS, the Head Cashier to the Bristol Gas Company. At the funeral at the Wesleyan Church, Combe Dingle, the Bristol Gas Company were represented by Sir George Davies (Chairman of the Directors), Mr. J. Fuller Eberle (Vice-Chairman), and Mr. T. E. Halliwell (Secretary).

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

July 24.—INSTITUTION OF GAS ENGINEERS.—Executive Committee, 10 a.m.; Finance Committee, 11.30 a.m.; Benevolent Fund, Committee of Management, 12 noon; Council, 2 p.m.

July 25.—INSTITUTION OF GAS ENGINEERS.—Ammonia Sub-Committee, 11.30 a.m.; Liquor Effluents Sub-Committee, 2 p.m.; Corrosion of Pipes Sub-Committee, 3.45 p.m.

July 25.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting of Chairmen and Secretaries of the Gas Salesmen's Circles at the Board Room, 28, Grosvenor Gardens, S.W. 1, at 2.30 p.m.

Aug. 19 and 20.—IRISH ASSOCIATION OF GAS MANAGERS.—Meeting in Dublin.

Sept. 8-11.—ASSOCIATION OF PUBLIC LIGHTING ENGINEERS.—Annual Meeting and Conference at Leicester.

Sept. 9.—FEDERATION OF GAS EMPLOYERS.—Meeting of the Central Committee.

Sept. 9.—NATIONAL GAS COUNCIL.—Meeting of the Central Executive Board.

Sept. 11.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting at Aberdeen.

Sept. 18.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—General Meeting at Porthcawl.

Oct. 10.—MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.—Visit to the Manchester Corporation Gas-Works at Partington.

Oct. 27 to 29.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting at Hull and Bridlington.

ON THE ELECTRICAL SIDE

Watch the Lighting.

A series of conferences in different parts of the country is being organized by the E.D.A. and the E.L.M.A. in connection with a shop and display lighting campaign to be held from Sept. 15 to Nov. 30. They are to be open to anyone engaged in the electrical industry. The objects are to be the replacement of all obsolete shop lighting equipment; increased shop lighting intensities, inside and out; the lighting of shop facias; the floodlighting of shop frontages; the general use of electric signs; extended use of show case and counter lighting; the use of illuminated directional and other signs in shop interiors; after-hour lighting of shop premises; generally to stimulate public appetite for brilliant illumination. A survey is projected of existing shop lighting conditions. In many of the E.D.A. Circle areas it is hoped that means will be found to link-up the shop lighting campaign with shopping and civic weeks, or other local festivals, and to offer prizes, through the local organizing committees, for the best-lighted windows in shop lighting competitions. It is anticipated that other organizations will offer similar prizes. Three direct mail postal communications will be sent to about 200,000 shopkeepers, and will comprise letters, booklets, and reply postcards. Illustrated editorial articles on every phase of shop and display lighting will appear in technical and trade journals, before and during the campaign; while articles of distinct news value, and at the same time reflecting the objects of the campaign, will appear from time to time in the general Press. Now, what is the gas industry going to do about it?

How One Can Obtain Current.

The contributor of an article on rural electrification, published in the "Electrical Times," shows how the Birkenhead Corporation are successfully supplying "the dormitory district of the Wirral Peninsula," and what he has to say on the subject of rates and charges may probably be accepted as applicable to other out-district areas. Here it is: "Quite recently there have been further reductions in charges, which have brought the ordinary flat rate for lighting down to the pre-war rate of 4d. per unit. Under the domestic rate there is a fixed charge of 14 p.ct. of the rateable value of the premises, *plus* ½d. per unit. The minimum rateable value assessment is £18 per annum, and consumers are required to install a reasonable amount of domestic apparatus; the minimum amount being fixed according to rateable value. Outside Birkenhead the flat rate for lighting is 5d. per unit, and there is an increase of 25 p.ct. on the domestic rate. Domestic appliances are supplied on simple hire, hire purchase, or cash terms, and again the terms offered are reasonable enough to encourage demand. With regard to wiring, the prospective user may enter into a deferred payment scheme under which he pays the cost of the installation over a period of four years by 16 equal quarterly payments; or there is the alternative for small private houses of going under the assisted wiring scheme. In this case no initial charge is made for the installation, but the consumer pays an extra 1d. per unit for the electricity used through a prepayment meter until the installation is paid for. In the out townships this means a charge of 6d. a unit until the cost of the installation is wiped out."

The Milch Cow.

Electric milking machines, the Press informs us, were prominently featured at this year's Royal Agricultural Show, and several important developments have taken place in this connection. Milch cows will doubtless take due note of this.

Continuous Meter Reading.

We learn from the "Electrical Review" that the new system of continuous meter reading adopted by the North Metropolitan Electric Power Supply Company has not only resulted in greatly improved office efficiency and in overcoming the bad "load factor" and the consequent confusion of the old system, but it has also brought about one very desirable thing—a steady flow of consumers to the offices and showrooms throughout the year. Last year some 250,000 accounts were rendered by the organization, or about 1200 per day.

CORRESPONDENCE

Correspondence Classes.

SIR,—Approved correspondence classes in gas and cognate subjects would be beneficial in these keenly competitive times. That a helpful course on salesmanship could be specially designed for gas technicians, who owing to pressure of duty and other causes are unable to attend regular lectures at fixed hours, is apparent.

As was suggested some years ago, when courses for gas salesmen were mooted in your columns, such instruction should follow (not precede) the study of gas supply and ancillary subjects.

Adverting to Mr. Mogford's letter published in the "JOURNAL" for July 16, while the last paragraph may be perfectly true, the undersigned, who writes as a student, a teacher, and a busy member of the "sales" staff, believes that, "having a diploma in their pockets" need not necessarily redound to the salesmen's, the industry's, or our customers' disadvantage, the price of therms (or B.O.T. units) notwithstanding.

EDWARD C. LE JEUNE,
Assoc.M.Inst.GasE.

42, *Ormiston Road,*
Greenwich, S.E. 10,
July 17, 1930.

SIR,—I regret the necessity to reply to Mr. Mogford, but he raises several points which cannot be allowed to pass without comment.

First, he says "the Technical Colleges at approved centres have, at considerable expense, provided facilities;" also "the number of students taking the Institution course at many centres is insufficient to justify the continuance of classes, and students taking the main subject only have to be admitted to make the requisite minimum."

This is apt to be misleading. It would be, I think, more correct to say that the Gas Education Committee have, at considerable trouble and expense, arranged for facilities at all centres where the number of students reaches the minimum required to secure by their fees and the grants earned by them the finances for the running of the classes. It is obviously unnecessary to specify a minimum where students join classes in ancillary subjects which already exist. In this case the gas student has precisely the same privileges as any student who requires these subjects for any purpose whatsoever, and also the disadvantage of varying standards, as these classes in any one subject do not follow a fixed syllabus. Each school has its own. Hence the lack of a uniform standard about which Mr. Mogford complains, and which can only be remedied by the setting-up by the Institution of examinations in the ancillary subjects common to both internal and external students.

Secondly, as I have spent nearly seven years in an endeavour to assist external candidates, I feel I have no alternative but to protest on their behalf against the following paragraph. "Youths taking a full course of three or four nights per week for five, six, or seven years find that one weak subject lands them with a second-class certificate, while the easy-going external candidate, with a lesser knowledge of ancillaries, laughingly produces a first. They put up with the handicap placed on them by lack of uniformity of standard at different centres, but the 'short-cut' facilities have disheartened many good fifth-year lads."

These remarks are grossly unfair not only to the external student, but also to those who have prepared the syllabuses. If anyone with teaching experience will examine carefully the syllabuses in the ancillary subjects set up for external students he will find that it requires continuous hard work to cover them effectively within the period of the longest winter session (32 working weeks, excluding revision and examinations) of an approved school. I happen to know this because during the past winter I have organized courses in them, and have employed a fully qualified and widely experienced teacher for the preparation of the lessons in each subject. Actually our courses extend for over 32 working weeks. The point here is that external students have to cover fully the syllabus; internal students are examined only on the work they have done. In other words, an external student may have a greater knowledge of the ancillary subjects; he cannot have less, and he is examined by bodies appointed by the Institution to make certain that the standards are correct. There is nothing wrong with either the syllabuses or the standards. They must have been very carefully thought out.

Precisely the same applies to the Ordinary Examinations in Gas Engineering and Gas Supply. Anyone who works fully through our courses in these subjects will find that two to three times the prescribed number of hours worked is required to complete them. Again there can be nothing wrong with the syllabuses or the standards.

Thirdly, Mr. Mogford says that our figures speak for themselves, but he implies by his remarks that we employ short-cut methods. Actually the chief reason why we have not double

the number of students (we get the inquiries) is because we are too exacting. Possibly the same remark applies to internal candidates. If it were not so we should not be able to guarantee to coach students until successful in the examinations without the payment of any further fees if they submit their work regularly as instructed. No one, however, need take our figures, but rather take instead the number of successful and unsuccessful internal candidates for the Higher Examinations. They sit the same examinations as the external candidates. An extraordinarily large number of internal students fail in these examinations.

The soundness of the Education Scheme to me turns upon the fact that it foredooms to failure any attempt at a short-cut. No! the reason for "the disheartening of good fifth-year lads" must be looked for nearer home. Incidentally the successes of our students in the examinations for the Diploma in Gas Engineering clearly establish the fact that we are assisting to produce the men the industry requires.

Many may wonder why we do not publish an impressive list of tutor's names. We did at first, but an active prejudice demanded a wiser policy. The names are available when required.

Personally, I think the difficulty lies in gaining the confidence of candidates. The scheme is sound enough, but certain administrative details do not inspire confidence. For example, the non-recognition of facilities for external candidates creates the impression that they are a sort of "next-best-thing." They may enter by the back door. Evidently there is also a feeling abroad that the back door presents the easiest way in; so internal students are dissatisfied. The front door has too many steps. An external student taking courses with us has to take the same number of years over the work as the internal student; he cannot get through the work set in less. There are the same number of steps back and front. The remedy is simple and obvious. The position, broadly, is that of electricity *v.* gas, or State-aided enterprise *v.* private enterprise. Surely there is room for both.

Fourthly, correspondence classes do more than assist candidates to pass examinations. Here is an extract from a letter I received a week ago from a student who has just completed the first year's work of our Gas Salesmen's Course. "I have thoroughly enjoyed the lessons set and am extremely satisfied. I have found the lessons of incalculable use, especially as I have very little experience of practical work. . . . I had the pleasure of inspecting the . . . meter repair shop, as well as the cooker cleaning and repairing section. Delighted to say that the lessons enabled me fully to understand the whole of the work, parts of meters, testing apparatus, &c." The letter is enclosed for your perusal. We have an excellent collection of letters of this type, all unsolicited. We do not publish them. We allow our work to speak for itself.

Fifthly, in the latter part of his letter Mr. Mogford makes what amounts to an appeal for a short-cut course in salesmanship. It is difficult to reconcile this with the fundamental principle of the Scheme, or with the other points he has raised. Short-cut methods are no good to anyone, and least of all to salesmen. Such a course can only be arranged by assuming that gas salesmen are technically fully equipped, and that consequently all they require is instruction in the "psychology of selling" (a frightful phrase), which a dozen lessons would cover. Salesmen cannot sell appliances unless they know all about them. A salesman must know not only his goods, but also those of his competitors. It is not enough to be able to quote advantages and disadvantages from pamphlets or lessons. The salesman the gas industry requires must be able to present attractive solutions for heating, lighting, and industrial problems. When they can do this, then is the time to introduce the psychological factor to help with the approach and the closing of the sale. I have always been in complete agreement with Sir Francis Goodenough on this point. The difficulty appears to be that to expect salesmen first to obtain the Diploma in Gas Supply is asking too much. A modified Ordinary Examination in Gas Supply with the concentration of attention upon appliances, rather than upon the actual distribution of gas, would, I venture to suggest, constitute an excellent first step in a course for gas salesmen, and this would be entirely in accord with the fundamental principles involved in the present scheme.

The main point I wish to make is that the Education Scheme has been proved sound, but there are regulations which cause great and growing dissatisfaction. These are administrative, and in no way affect the Scheme itself, but they prevent that confidence in would-be candidates without which real progress cannot be made.

ARTHUR COE.

The Gas College,
3, Thrum Hall Lane, Halifax,
July 18, 1930.

THE NEWS OF THE WEEK

New Showrooms were opened by the Whitchurch (Salop) Gas Company last week in High Street containing an up-to-date show of gas appliances, &c.

No Objection is to be offered by the Evesham Rural District Council to the decision of the Cheltenham Gas Light and Coke Company to extend the supply of gas from Winchcombe to Broadway.

The Oswestry Gas-Works were visited by a large number of day students of the Oswestry Technical Institute last week. They were conducted over the works by the Manager, Mr. E. T. Davies, and spent a very interesting time.

The North British Association of Gas Managers hold their Annual General Meeting this year at Aberdeen on Thursday, Sept. 11 next. The usual annual excursion will take place on the following day, Friday, Sept. 12, and will take the form of a visit to Deeside by motor coach. There has been arranged the usual full programme of social events.

A Successful Bread Baking Competition organized by the Newcastle-on-Tyne and Gateshead Gas Company was held at the Wallsend Charity Carnival. There were over 40 entries, and the first prize—a set of aluminium ware—was awarded to Mrs. G. R. Scott. The second prize—an enamelled gas-iron and stand—went to Mrs. Nicholls; and the third prize—two silk gas shades—was awarded to Mrs. Aitchison.

The National Mark Week was signalized at Leamington by the engagement of Miss L. Parkyn, Diplomée N.T.S.C., by the Leamington Priors Gas Company to give demonstrations throughout the week on the use of National Mark Produce in bread-baking and other produce. Miss Parkyn, it will be remembered, carried out demonstrations some time ago on the occasion of the Bread-Baking Competition arranged by the Empire Marketing Board at Olympia.

Cheaper Gas for Market Harborough is the result of the successful working of the Gas Department during the past financial year. The reduction amounts to 2½d. per 1000 c.ft.

Electrical Cooking Apparatus Being Too Expensive in the opinion of the Shoreditch Borough Council General Purposes Committee, it is recommended that gas apparatus be installed in the kitchen which it is proposed to equip at the Town Hall.

The First Volume of "The Welder" is now completed with the current issue, and arrangements have been made to provide covers for the first six numbers, which will be supplied free upon application to Alloy Welding Processes, Ltd., Ferry Lane Works, Forest Road, E. 17.

Dividends in respect of the half-year ended June 30 last have been declared by the Tottenham and District Gas Company as follows: On the 5 p.ct. preference stock, 5 p.ct. per annum; on the 5½ p.ct. preference stock, 5½ p.ct. per annum; on the ordinary stock, 6⅝ p.ct. per annum—all less income-tax. They will be payable on Aug. 9 next.

A Bogus Gas Meter Inspector in the person of George Leonard Moulds (38), of Gladstone Street, Leicester, was sent to prison for three months on July 17 for stealing money from slot gas meters. It was stated that Moulds called at houses, saying that he had come to inspect the meter. He then opened the meters with a key and took the contents.

A Dividend of 10 p.ct., tax free, was declared at the annual meeting of the Uppingham Gas Light and Coke Company—Mr. C. Hawthorn, Chairman of Directors, presiding. The revenue account for the year ended March 31 showed that receipts totalled £4851, leaving a profit balance of £483. Sales of gas brought in £3774. The Chairman announced that there was contemplated a reduction in the price of gas from 4s. 9d. to 4s. 6d. per 1000 c.ft. in September.

For the Promotion of Exhibitions throughout the country a company has been registered under the direction of Mr. F. E. Bussy, who is well known as the founder of the Ideal Home Exhibitions, and was responsible for the successful conduct of that and other newspaper enterprises of a similar kind over a long term of years. There is probably no man in the country who knows more about Exhibitions and how to run them profitably. Among those associated with Mr. Bussy, in the direction of the exhibitions, will be Mr. W. P. Forbes, J.P., Mr. Marcus de la Poer Beresford, and Col. the Master of Sempill.

Opposition to the Erection of a Gasholder is being organized by ratepayers in the Carleton Road district of Skipton. The site suggested is one adjoining the cricket club field in that locality, and the Society for the Preservation of Rural England have been asked to support the opposition. A condition of the Ministry of Health is that the consent of the ratepayers living within 300 yards of the site should first be obtained; but the residents contend that in case of accident the site's closeness to houses and to the road might render it dangerous. It is held also that the erection would spoil the amenities of the locality, and, further, that as the site is a distance from the gas-works there is a possibility of the district being still further spoiled in the future by the installation of gas-making plant there. It is urged that there is sufficient room at the gas-works for the holder, which, it is understood, is an experimental one, on an American patent.

To Help Housewives to get the best results from their cookers the Liverpool Gas Company arranged a series of lectures and practical demonstrations at their showrooms in Duke Street, Liverpool, to be given twice daily for ten days by Miss E. K. Eason (Diplomée N.T.S.C.). At the first one, on July 14, a large number of Liverpool women and a fair sprinkling of men (not to mention school children on holidays) were present, and the lecturer made three different dishes demonstrating how two types of gas cooker could be used to the best advantage. Both had one of the new " Regulo " controls. The menus throughout the week were varied, and on Thursday afternoon Miss Eason cooked a full dinner in an oven at one setting and time, the oven being padlocked and the key held by a member of the audience. This was to show that all kinds of food could be cooked at one time without one affecting the other in any way. On Friday afternoon the lecturer made " request " dishes.

South Suburban Gas Company Co-Partnership Festival.

The Annual Co-Partnership Festival of the South Suburban Gas Company was held once again at the Crystal Palace this year on Saturday last, July 19—a total estimated at approximately 2000 co-partners and their wives, pensioners, and war widows being present.

Among those present, besides Dr. Charles Carpenter, C.B.E., President of the Company, were Mr. and Mrs. B. R. Green, Mr. and Mrs. H. Gundry, Mr. W. Wastell (Secretary and Commercial Manager) and Mrs. Wastell, Mr. John Terrace (Chief Engineer), Mr. F. G. Gorman (Assistant Engineer), and many other senior officers of the Company.

Throughout the afternoon an entertainment was given by " The Roosters " Concert Party in the Palace Theatre, during an interval in which Dr. Carpenter addressed a few words of welcome to those present.

Dr. Carpenter's Address.

I am following a time-honoured custom, said Dr. Carpenter, by appearing here this afternoon on behalf of my colleagues, the other members of the Board of Directors, and expressing pleasure at seeing you all here taking part in this historic festival of co-partnership, and once more expressing the gratitude for all that co-partnership has done for you. May I remind you, when you think of what has been done, of the different position which you enjoy in comparison with a large number of fellow workers in this kingdom.

In a sense you are members of a sheltered industry. That is to say, it is sheltered from foreign competition from abroad. The nearest parallel industry to the gas industry is that of the blast furnaces and coke ovens, and there we are told that whereas a few years ago something like 30,000 people were employed in that industry, to-day there is only work for 20,000. That is a serious drop, and we can imagine the hardship in hundreds of homes caused thereby. In that sense, therefore, you are a sheltered industry.

Gas Supply No Longer a Monopoly.

Nevertheless, competition is keener than ever before in this country itself. The old idea of gas supply being a monopoly is to-day exploded, and the gas industry is face to face with increasingly keen competition from other sources of energy and supplies of fuel. So when you rejoice at the employment which the gas industry gives you, I would ask you to bear in mind your duty to do all that you possibly can to maintain the supremacy of the industry with which you are associated.

You and I, continued Dr. Carpenter, have been through very many years of co-partnership progress; many of you started it with me. You know what it has done to bring a change about your ordinary life, and I would ask you, in reflecting upon that change, to have this picture before you.

Co-partnership cannot be credited with having brought into industry what we call welfare work. Welfare work dates back farther than co-partnership. Nor has it brought into being sickness funds. Provision for sickness is older than co-partnership. Nor has it brought into being those conditions common in the factory. That is to say, industry carried on under healthy and hygienic lines.

What Co-Partnership Has Done.

What then can we say that co-partnership has done? We may say this. If we look at our streets on a dull day; if we look at our houses, at our favourite walks or rooms, they all exist under conditions such that when the sun shines something happens to make them wear a different atmosphere, although they themselves are unchanged. The great thing, therefore, that co-partnership has done—while it has not altered substantially the facts of industry—is to bring sunshine into our lives.

Ladies and gentlemen, concluded Dr. Carpenter, on behalf of the Board of Directors, I welcome you here at this festival of co-partnership this afternoon.

At the conclusion of a most enjoyable afternoon's entertainment, the company were entertained at tea at the invitation of the Directors.

Keith-Blackman Week of Social Events.

The Holloway Road (Islington) Works of Messrs. James Keith & Blackman Company, Ltd., concluded on July 5 what must have been a record week in the social life of the Company. In the seven days there were two dinners, a presentation, a sports meeting, and the retirement of one of the firm's oldest employees, in the person of Mr. A. Millen (Works Manager), who has been with the Company for 43 years.

On Saturday, June 28, was the annual works outing to the Isle of Wight, when a party of 140, including five of the Directors of the Company, spent an enjoyable day at Ryde. At a luncheon at the Esplanade Hotel, the toast of " James Keith & Blackman Company, Ltd.," was proposed by Mr. A. Millen, who reminded his listeners that this was the last occasion on which he would attend an outing as Works Manager, his retirement from that position taking effect on the following Monday. Mr. C. Galloway, who had been his Assistant for many years, would succeed him as Works Manager, and he asked the staff, foremen, and workers to support Mr. Galloway as they had supported him (Mr. Millen) in the past.

Mr. Keith (Chairman and Managing Director of the Company), replying to the toast, mentioned that a scheme of pensions had been settled whereby a worker who had been in the Company's service for twenty years or more, and who wished to retire at 65, would be paid 1s. a week pension for every year he had served the Company.

The complimentary dinner on Tuesday, July 1, given by Mr. A. Millen to the Directors and Chiefs of the Head Office staff, to mark the occasion of his retirement from the position of Holloway Works Manager, after 43 years' service, was held at the Trocadero, and a party of 20 was present.

Mr. Keith proposed the toast of " Our Host." He had been, he said, in close personal contact with Mr. Millen since the amalgamation in 1900 of his father's business with the Blackman Ventilating Company, at which time Mr. Millen was machine shop foreman at Holloway Works, and had already been in the Blackman Ventilating Company's service for 13 years.

Mr. J. W. Hampsheir (General Manager and Director) seconded the toast, which was duly acknowledged by Mr. Millen.

After a short speech by Mr. M. Burningham (Director and Secretary), who had organized the function on behalf of Mr. Millen, the host invited his guests to spend the rest of the evening with him at the " Dominion Theatre," where they witnessed the musical comedy, " Silver Wings."

On Thursday evening (July 3) Mr. Millen gave another dinner to mark the occasion of his retirement. This dinner was held at Beale's Restaurant in the Holloway Road, and to it were invited the foremen, heads of departments, and long-service workmen engaged at the Holloway Road Works of the Keith-Blackman Company—40 in number.

The fourth outstanding event of the week was the holding on Saturday, July 5, of the second annual sports meeting of the James Keith & Blackman Company's Athletic Club, on the club's ground, in the new Cambridge Road, Tottenham. Members and their families and friends were present in large numbers, and took a keen interest in the competitions.

After the last race had been run, Mrs. Keith (wife of the

THE NEWS—*continued.*

Chairman and Managing Director of the Company and President of the Club) presented the prizes.

Next followed the presentation to Mr. A. Millen of a Grandfather Clock and Columbia Gramophone, which had been subscribed for by the firm's Directors, staff, and workmen, to mark the occasion of his retirement from the Works Managership. Mr. Keith made the presentation.

The day concluded with a concert at the sports ground.

Merchandise Marks Act, 1926.

The Board of Trade have referred to the Standing Committee appointed by them under the Merchandise Marks Act, 1926, an application for an Order in Council to require the following classes and descriptions of imported goods to bear an indication of origin:

(1) Air and gas compressors and exhausters, and beds, casings, cylinders, rotors, and heads therefor.
(2) Pneumatic tools and appliances, including mining coal cutters operated by compressed air, and cylinders, heads, pistons, and valves therefor.

Representatives of any interests substantially affected by the application who desire to be heard in opposition at the public inquiry, which will be held later by the Committee, should communicate with the Secretary, Mr. E. W. Reardon, at the Board of Trade Offices, Great George Street, London, S.W. 1, as early as possible, and in any case not later than Aug. 31, 1930.

Lighting Conference.

This month a two-day International Lighting Conference was held at the Headquarters of Messrs. Holophane, Ltd., Vincent Square, S.W. 1; and on later pages will be found extracts of two papers which were contributed to the proceedings. Our photograph is of a group of representatives of the firm.

Terms of the Southend Amalgamation.

We have already announced that agreement has been reached for the amalgamation of the Southend-on-Sea and District Gas Company with the Gas Light and Coke Company, subject to the approval of the stockholders and sanction of Parliament. The Directors of the former Company recommend the acceptance of the proposed terms—viz.:

The date of transfer is to be Jan. 1, 1932.

Every registered holder of £100 original consolidated stock and/or new ordinary stock of the Company is to receive £130 ordinary stock of the Gas Light and Coke Company, and to every registered holder of £100 new ordinary "B" stock of the Company £123 6s. 8d. ordinary stock of the Gas Light and Coke Company, and to holders of original consolidated and/or new ordinary stocks a sum in cash equivalent to £7 13s. for every £100 of stock of such holders, and to the holders of new ordinary "B" stock a sum in cash equivalent to £7 5s. 6d. for every £100 of stock of such holders.

Every holder of £100 of 5½ p.ct. irredeemable preference stock will receive £137 10s. 4 p.ct. consolidated preference stock of the Gas Light and Coke Company, and every holder of £100 6 p.ct. irredeemable preference stock £150 4 p.ct. consolidated preference stock of the Gas Light and Coke Company.

Every holder of £100 4 p.ct. perpetual debenture stock will receive £133 6s. 8d. 3 p.ct. consolidated debenture stock of the Gas Light and Coke Company, and every holder of £100 5 p.ct. perpetual debenture stock will receive £166 13s. 4d. 3 p.ct. consolidated debenture stock of the Gas Light and Coke Company.

The consolidated preference and debenture stocks so issued to rank from the date of transfer *pari passu* with the existing 4 p.ct. consolidated preference and 3 p.ct. consolidated debenture stocks of the Gas Light and Coke Company.

Provision has been made that holders of ordinary, preference, or debenture stocks shall be entitled only to amounts of £1 or any multiple thereof, and where a holder would but for this provision become entitled to an amount of stock less than £1, such holder shall be paid in cash in lieu of stock the market price of such fraction of £1 on the date of transfer.

The Directors of the Company will receive as compensation for loss of office a sum equal to seven years' purchase of the remuneration calculated according to the annual rate of the Directors' fees in force at the date of agreement of the proposed amalgamation.

The Auditors will receive as compensation for loss of office a sum equal to three years' purchase of the remuneration calculated at the rate in force at the date of agreement of the proposed amalgamation.

Terms have been arranged with the Gas Light and Coke Company for compensation for loss of office to both the Secretary and the Engineer and Manager.

The interests of all the employees of the Company have been safeguarded in the event of their services not being required as a result of the proposed amalgamation.

An extraordinary meeting of the Southend Company will be held on July 30 to consider this matter.

Notes from Scotland.

The Price of Gas in Kirkcaldy has been reduced from 4s. 3d. to 4s. per 1000 c.ft.

The Blackford Gas Undertaking, including the Gas Manager's house, has been purchased by Mr. James Kirk, Gas Manager at Auchterarder.

A Profit of £1000 16s. was reported at the annual general meeting of the Lochgelly Gas Light Company, and a dividend at the rate of 6 p.ct. was declared.

A Dividend of 12½ p.ct. was recommended at the annual general meeting of the Dunning Gas Light and Coke Company, Ltd.—Mr. W. Brown presiding. The balance-sheet and Directors' report showed the satisfactory condition of the Company.

The Department of Health for Scotland has agreed to the Fraserburgh Gas Department taking over the gas cookers in the housing scheme, and that each rent be reduced by 5s. per annum, which sum will be paid to the Gas Department in lieu of cooker rents.

A Dividend of 5 p.ct., less income-tax, was declared, together with a bonus of 1 p.ct., at the annual meeting of shareholders of Alyth Gas Light Company—Mr. C. D. Mitchell, Chairman, presiding. There was submitted a satisfactory financial report for the year ended June 2, which was approved.

Dividends were Announced at the rate of 7½ p.ct. at the annual general meeting of the shareholders of the Blairgowrie Gas Light Company, and at the rate of 8 p.ct. free of tax at the annual meeting of the Vale of Leven Gas Light Company. The price of gas was fixed at 3s. 4d. to ordinary consumers in the Vale of Leven district.

A Reduction in the Price of Gas has been decided upon by the Burntisland Town Council from Aug. 1. The price will be reduced by 2½d. per 1000 c.ft., making it 3s. 6½d., as against 3s. 9d. at present. The annual report of the Gas Department showed that during the past year the consumption of gas was a record one for the town.

The Price of Gas in Hamilton has been increased by 5d. per 1000 c.ft., making the rate 2s. 8½d. per 1000 c.ft. Also the Catrine Gas Company have decided to raise the price of gas from 5s. 10d. to 6s. 8d. per 1000 c.ft., owing to increased expenditure. The price of gas in Keith has been reduced to 6s. 3d. per 1000 c.ft. for light and heat, and to 5s. for power purposes.

The Annual Report of Montrose Gas Company showed that receipts from slot meters accounted for more than half the revenue from the sale of gas, the amount being £9434, as against £8333 from other gas sales. Bad debts amounted to £1 16s. 8d., and the total revenue was £19,700. After deducting depreciation, total profits were £5595, and a dividend of 5 p.ct.

is recommended, making 10 p.ct. for the year. The reserve fund stands at £12,500.

The Annual Report of Crail Gas Company shows a gross profit for the year of £705. The net profit is £625, to which has to be added the balance of last year's account, amounting to £423, making £1048. Deducting £120 as dividend paid last year, the sum of £928 remains, and the Directors recommend that a dividend of 6 p.ct., free of tax, should be paid, leaving a credit balance of £808. Gas sales amount to £2140, and the sale of residual products brings this total to £2384. The manufacture and distribution of gas totals £1678.

The Output of Gas during the year of the Kirkintilloch Gas Department amounted to 116,721,000 c.ft.—an increase of 2,500,000 c.ft. over last year. The amount of coal carbonized was 7385 tons, while the average make of gas per ton of coal carbonized was 22,572 c.ft., or 101·57 therms, as compared with 21,385 c.ft., or 96·45 therms last year. There was a revenue of £1146 from residual products, and the charge to ordinary consumers was 2s. 1d. per 1000 c.ft for domestic purposes and 1s. 11d. for power consumers.

A Prosperous Year is indicated by the annual report and balance-sheet of Brechin Gas Company, Ltd., which has just been issued to the shareholders. From the balance of £2295 it is proposed to pay a dividend of 2s. 6d. per ordinary share, with a bonus of 3d. per share, less income-tax, which will require £1918, and leave a balance of £377 to carry forward. The gas made during the year amounted to 55,382,000 c.ft.—an increase of 609,000 c.ft. over last year. The income from gas sold was £11,161, and from residuals £1459, the cost of coal being £3823. The gross profit carried to profit and loss account was £3496.

The Gross Profits of the Dunfermline Corporation Gas Undertaking last year, it was reported, amounted to £21,919, after paying sinking fund interest and income-tax charges. There was a net profit of £1190. The sale of gas during the year showed an increase of £3266, but the receipts from residuals were lower by £873. The quantity of gas sold showed an increase of 11¼ million c.ft. Bailie Smith, Convener of the Gas Committee, said that during the past two years they had paid off over £20,000 of their outstanding debt, and in the next three and a half years the final payment towards the original debt of the Gas Undertakings would be paid. The decision of the Committee to allow the price of gas to remain at the same figure as last year—3s. 2d. per 1000 c.ft.—he hoped would tend to increase the output, especially in the use of gas for industrial purposes, for which very low prices were quoted.

A Hundred Years Ago the gas-works at Airdrie were built. The first step was taken by the Town Council, who held a meeting to consider having the town lighted by gas, and the second was taken at a meeting of private individuals who decided to proceed with the erection of a plant. The first capital of the Company was fixed at £2000, but, following representations from various people who could not obtain shares, it was decided to increase the capital to £2500. There were no dividends at first, but in later years the project paid its way well, and dividends up to 11 p.ct. were paid. The Town Council acquired the works in 1904 at a cost of £61,300. The Department is now one of the most prosperous of the many under the Council's control, and pays its way handsomely. There is an annual output of 140 million c.ft., and the price is 4s. 4d. per 1000 c.ft.

Corporation Undertakings' Results.

Brighouse.

The gas sent out during the year amounts to 208,012,000 c.ft., being 7,880,000 c.ft. more than last year. This is again a record output, in spite of the mild winter, as compared with last year. The gas sold and used is 197,119,200 c.ft., leaving 10,892,800 c.ft. unaccounted for, which is 5·2 p.ct. of the output. The average make of gas per ton of coal carbonized is 14,676 c.ft., as compared with 14,289 c.ft. last year.

Darwen.

A net loss on the gas undertaking of £1129 is reported, increasing the debit balance to £3430. There was a decrease in gas sales of 6,612,200 c.ft., and the unaccounted-for gas (14·12 p.ct.) showed an increase of 1·46 p.ct. This item, said the Chairman, was serious and largely accounted for the loss. A reduction of 4d. per 1000 c.ft. in the price of gas had accounted for a reduced income of £2377. The present price of 4s. 2d. per 1000 c.ft. was high, and it would be necessary to consider carefully where economies could be introduced.

Glasgow.

The gross revenue in the period amounted to £1,765,057. The gross expenditure came to £1,271,426, to which was added £104,509 for depreciation. From the balance of £389,121 there fell to be deducted (1) annuities on stocks, £16,925; (2) interest on borrowed money, £103,839; and (3) sinking fund, £136,000 —together £256,764. The surplus on the year's working was thus £132,357. This sum was applied towards the reduction of the balance at the debit of the profit-and-loss account at May 31, 1929—amounting to £199,792—leaving still to be carried to the year 1930-1931 a sum of £67,435.

The outstanding feature of the accounts this year was the saving of 7186 tons of coal, which, at a delivered cost of 17s. 5·712d., yields a sum of £6279. To this must be added the revenue of £27,152 from the increased sale of gas, amounting to over 161 million c.ft. While the consumers used this extra gas they paid £91,154 less for it than in the previous year, when the rate equalled an average of 3s. 7·002d. per 1000 c.ft. against an average of 3s. 4·434d. for the year just completed. This was a financial advantage to all consumers of 2·568d. per 1000 c.ft. of gas sold. The net sum realized from the sale of coke amounted to £175,437, being £25,037 greater than that of the preceding year.

Heywood.

The total capital expended during the year amounted to £2206. The gross revenue amounted to £34,375, and the gross expenditure (less interest and sinking fund) to £26,117, leaving a gross profit of £8258, and including £8189 interest and sinking fund a net profit of £68.

The total volume of gas manufactured was 156,718,000 c.ft., of which 12,410,000 c.ft. was carburetted water gas. A total of 7960 tons of coal were carbonized giving an average make per ton of 18,129 against 17,877 c.ft. last year. The volume of gas sold, as registered by consumers' meters, was 140,486,900 c.ft.—an increase over the previous year of 2,958,300 c.ft., equal to 2·15 p.ct. Owing to the reduction made in the price of gas of 2d. per 1000 c.ft. which operated during the December and March quarters, the receipts for the sale of gas (not including public lighting and bad debts), were only increased by £117.

The volume of business carried through at the showroom showed a marked expansion over previous years. During the year 1375 orders for apparatus were taken, consisting of 430 cookers, 45 fires, 95 wash-boilers, 251 irons, and 554 lighting burners, against a total of 1024 orders during 1929.

Lisburn.

The auditor's report on Lisburn Gas Undertaking shows that the expenditure for the year amounted to £16,003, and the income to £21,396—a gross profit of £5393. After the deduction of interest and instalments of loans there remained a net profit of £685, as compared with £660 for the previous year. Favourable comment was made on the report of the auditor by Mr. James Duff, J.P., who said it was important as dealing with the first year during which the Council was in competition with electricity and crude oil. The Department was, he said, standing up well and holding its own. It was in a clean, healthy condition and likely to remain so. As there was a surplus of money in hand, it was resolved to transfer £1000 to the general account to be used in the interests of the ratepayers. The motion was passed unanimously.

Loughborough.

Mr. G. H. Dean, in moving the adoption of the annual report of the Gas Committee, said the year had been one of progress, and the profits had not been made at the expense of economy. In three years the sum of £15,720 had been spent in modernizing the plant and upon general repairs. The total expenditure amounted to £35,941 last year, the income being £36,414, leaving a balance of £1283, in spite of 1d. per therm increase in the price of gas.

Stafford.

The gas made during the year was 367,474,100 c.ft., compared with 369,677,000 c.ft. last year, being a decrease of 2,202,900 c.ft., or 0·59 p.ct. The gas accounted for amounts to 353,483,100 c.ft., compared with 355,701,000 c.ft. last year, a decrease of 2,217,900 c.ft., or 0·62 p.ct. This leaves 13,991,000 c.ft. unaccounted for, or 3·80 p.ct., as compared with 3·78 p.ct. last year. During the year 19,876 tons of coal were carbonized, compared with 19,318 tons last year, resulting in a make per ton for this year of 18,488 c.ft., compared with 19,136 c.ft. per ton last year, a decrease of 648 c.ft. per ton. This is partly due to a slightly better quality of gas being maintained throughout the year, and to the fact that one bed of retorts was very old, which made the carbonizing of the coal difficult and not quite as efficient as in the previous year.

During the year the following apparatus was fixed: 357 gas fires, 329 cookers, 79 wash-boilers, 69 radiators, geysers, &c., while 745 cookers, grillers, fires, &c., were cleaned, repaired and refixed. New consumers for the year total 236.

The result of the year shows a gross profit of £11,921, against £18,723 last year, a decrease of £6802. After providing for repayment of loans, interest on capital, and income-tax, there remains a net profit of £3329, against £9847, a decrease of £6517.

Profits Spent on Plant and Income-Tax. . .

In which a contributor suggests a Commission of Inquiry, free from political or party bias, to examine the whole implications of industrial taxation and rating.

A point of considerable interest to gas undertakings was raised during the discussion of the Finance Bill (as amended by Committee) in the House of Commons on Thursday last. Mr. Churchill moved a new clause relieving from income-tax money expended during the next three years on the improvement of plant and machinery. The Chancellor of the Exchequer (Mr. Philip Snowden) resisted the proposal, urging that it would cost something like £30,000,000 annually and "would benefit industries that needed it least." In the end, the clause was rejected by 246 to 142 votes.

It may be conceded that the circumstances are not very propitious for securing tax remissions when the modern tendency of legislation is towards increasing national expenditure, either in redemption of promises made at the "hustings" or in anticipation of favours to come when that tribunal is forming judgment upon the country's Government. Despite the fact that British industry is engaged in a keen struggle to cast aside the depression which has caused the figures of unemployment to rise to nearly two millions—50 p.ct. increase upon the record of twelve months ago—almost with nonchalance our legislators ceaselessly project extended social services, the inevitable effect of which will be to add further burdens upon the taxpayer. In the matter of unemployment, by authorizing fresh schemes of "relief," voting sums for them, and for paying the "dole" to those who remain unemployed, our Government merely palliates effects, when it should be more earnestly striving to remove causes. Even when a little alleviation in taxation takes place here or there, it ensues from visions of the ballot box rather than from a desire to promote industrial or national prosperity.

We need a radical change of focus. That brings me back to the point raised by Mr. Churchill last Thursday, which cannot prudently be swept aside by such generalizations as that resorted to by Mr. Snowden. Let us test the proposal as it would apply to gas undertakings. Gas undertakings are acutely, if not painfully aware that the revenue officials scrutinize every item of expenditure to see if anything, big or little, has been put to revenue expenditure which, in the tax inspector's view, should have been placed to capital. Year by year a detailed catechism on the accounts is submitted in writing to the official responsible for the preparation of the accounts, and the final result is almost invariably that tax is levied on a sum substantially greater than the amount paid out in dividends and interest on the capital employed for the purposes of the undertaking. If a reconstruction is in progress, the clearest evidence is required upon what proportion represents replacement and what falls under the classification of improvement. If a sum is set aside from profits to "special purposes" or other fund established to meet future exigencies, income-tax is levied on the amount, even though the amount remains undistributed, and cannot in fact be distributed as part of the profits. If a draft on any such fund is made in future years, tax is allowed upon that amount, but in the meantime the undertaking has been deprived of "*x*" interest and accumulated interest on tax payments upon funds set aside purely for working contingencies. All this indicates how tightly the grip of taxation is put upon gas undertakings, and, inferentially, upon industry generally.

There is increasing clamour for easement of the taxation burdens upon industry, which not only curb its development, but to-day come dangerously near to killing the goose from which the golden eggs of national income have emerged in the past by promoting prosperity in all sections of the people. It is not wholly true, as Mr. Snowden suggests, that relaxation of taxation on cost of improvement in plant and machinery would benefit industries which do not need it. Particularly is it untrue as regards industries whose dividends are limited by statute. It should be possible, as an aid to industrial recovery, to discriminate between those industries which set aside in all sorts of funds a surfeit of profits remaining after doing the shareholders well, and those industries less fortunately placed.

Among things which will conduce to industrial recovery is a plentiful supply of cheap gas. That desideratum is easier of attainment with lower capital charges; and lower capital charges are promoted by meeting as far as possible costs of reconstruction and extension out of revenue. The revenue authorities get the benefit of the reconstruction in additional profits arising from same, and can well refrain, in the national interest, from imposing taxation upon the first cost. Even if the additional savings effected by reconstruction and improvement are distributed by way of a reduction in the price charged for the commodity (in this case gas), the community benefits, though the inland revenue may go without additional increment.

It will not escape attention that in this connection the gas industry has failed to secure the de-rating benefits which have been granted to most industries, and even to some which are direct competitors with the gas industry in the disposal of bye-products. ("Industries" which were never visualized as entitled to or intended to secure de-rating are nevertheless securing by appeal right to the three-quarters rebate which the De-Rating Act provides.) Both in taxation and in rating, gas undertakings are burdened to the maximum. What is needed is a Commission of Inquiry, freed from all political or party bias, which will examine the whole implications of industrial taxation and rating, and chiefly from the angle of how best any modification in the present system will induce industrial recovery.

If it was good for industry that certain favoured sections of it should be relieved of three-quarters of their rating burdens, it cannot be ill to extend the same principle to taxation as applying to plant reconstruction and improvement, at least as concerns our basic industries. If a Commission of Inquiry were appointed, while it was about it that body might inquire what revisions are needful in the present system of rating to re-establish something approaching equity, and especially as regards vital industries. So far as the organizations of the gas industry are concerned, they can rightly be urged to press forward these questions for national inquiry, opportunity for which is afforded in the membership of the National Gas Council with the Federation of British Industries, and of the Federation of Gas Employers with the Confederation of Employers' Organizations.

The Electrical Fusion of Gas Pipes.

By H. C. WIDLAKE, A.M.I.E.E.,

Chartered Electrical Engineer, of the Plymouth and Stonehouse Gas Light and Coke Company.

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STEEL MAINS AND CORROSION . . . .

This is the first of two articles by E. E. JEAVONS, M.Inst.C.E., and H. T. PINNOCK, M.A. (Oxon.), F.I.C., who, as a result of their original researches, explain how electrolytic corrosion of steel mains may be prevented.

Since 1903 the authors have been studying the very important subject of the prevention of corrosion, and they think it may be of interest to British gas and water engineers to publish their experience. If the simplicity of the facts relating to the prevention of corrosion were appreciated, gas engineers particularly would use more steel mains, not only because there is now no need to fear corrosion, but because of the modern tendency to adopt much higher pressures in mains for ordinary distribution purposes. In passing, the view might also be expressed that in the future very much higher distribution pressures will be adopted; this is evident not only in England, but also in Germany and America. There is no doubt that properly thought out high-pressure distribution must generally be cheaper than low-pressure for long distances, and it is of the greatest importance that all the knowledge as to the life of steel pipes underground should be common property.

With the experience of a quarter of a century behind them, the authors are convinced that, with steel mains properly bitumen-coated, laid by experienced people, and earthed, there is now little or no danger from electrolytic corrosion (which is the principal and serious form of corrosion) if their method of procedure be adopted.

Adding to the immunity from corrosion the unbreakable quality of steel mains, it is obvious that more and more of this type of main will be laid as time goes on. This is especially the case in view of changing circumstances, not only in the actual distribution of gas, but in the new road-traffic conditions, with the resultant dangers of vibration causing heavy leakage losses and the risk of explosions.

The authors' main experience in preventing corrosion was gained on the distribution system of the Mond Gas Company, of Tipton, and the work done on this system is therefore described in full as typical for any steel main system.

Distribution of Mond Gas in South Staffordshire.

A brief résumé of the features of the Mond high-pressure distribution system will be helpful, before describing the preservation methods and the conclusions that led to their adoption.

About 40 miles of steel mains have been laid underground in very bad soils and in a dense industrial area, commencing from the Company's Works at Dudley Port, Tipton, and extending to Bilston, Wolverhampton, Willenhall, Walsall, Wednesbury, &c. At the gas-works end the trunk main is 30 in. in diameter and is of steel lock bar pipes 28 ft. long and jointed with run lead. This main bifurcates at Ocker Hill into two 27-in. trunk mains (one for Wolverhampton and one for Walsall) besides having branches radiating in various directions. On the way both these mains again bifurcate at Wolverhampton and Walsall respectively into two 21-in. mains encircling substantially each town, with numerous antennæ in all directions reduced down to 12 in., 10 in., 8 in., 6 in., and 4 in. in diameter. This network of mains naturally passes by many large works where electric plant is installed, and under many electric tramway systems.

In such a distance as 40 miles the network of mains also passes through many and various kinds of bad subsoils (often very acidiferous). The Company originally very carefully coated their mains with a bitumen mixture and brattice cloth coating, further protected by soft puddled and tempered clay. This was thought to be all that was necessary to protect them; but approximately about 1908, five years after the mains were laid, pitting due to some form of corrosion began to make itself manifest and caused a system of patching and plating to be adopted. This went on for a time (a year or two), and then it became alarmingly apparent that a somewhat similar condition to what had happened at Coolgardie in Western Australia might arise—that is, the amount of corrosion which at first was only slight rapidly increased until the mains were practically destroyed. Consequently, in 1916 the authors were instructed by the Board of the South Staffordshire Mond Gas Company to collaborate in a series of tests, mainly electrical in their nature, to investigate a suggestion that the corrosion might be electrolytic, at any rate in part.

The following is the actual verbatim report summarizing the work of this survey as submitted by the authors to the Board of the South Staffordshire Mond Gas Company and giving their recommendations.

REPORT ON ELECTROLYTIC SURVEY OF MAINS.

We have now completed the detailed survey of the mains, and established their polarity as referred to the surrounding ground.

Readings have been taken by connecting the various instruments in series between the main and a bar driven into the ground, and in order to obtain concordant results the bar has, when possible, been inserted in the ground to the same depth as the main itself, and at a constant distance (30 ft.) from it. Some 600 readings have been taken, and the results plotted and tabulated.

In many cases the quantities booked must be considered as below the actual value, owing to the difficulty of getting good contact on deeply sunk valve spindles; but in every case the direction of the current is accurate, and the quantities are never overstated.

We have proceeded on the assumption that if, and where, corrosion is due to electrolytic action, it should be confined to spots where the current flowing is either alternating or the main is acting as anode, being at higher potential than the ground surrounding it; and for this reason we have designated the readings on the plans as follows:

K = Kathode (immune from electrolytic corrosion).
A = Anode (liable to corrosion).
K A = Alternating (liable to corrosion),

During the past years, there have been found a number of spots at which corrosion, more or less severe, has taken place, and it was considered that if, after completing the survey, it should be found that the actual polarity of these points, generally, coincided with that theoretically necessary to produce electrolytic corrosion, then very strong evidence would be obtained that electrolytic corrosion had in fact taken place. However, at the outset, it appeared unwise to dogmatize too much upon this point, owing to the complicated and little understood causes of corrosion, and the possibility of even a kathode area suffering from corrosion owing to chemical action in bad or acid ground; but as the investigation proceeded this assumption of electrolytic action was repeatedly proved to be consistent with the facts ascertained, and in several cases we were able to predict corrosion at various points which subsequent investigation proved to be correct.

Dealing broadly with the results obtained, it has been observed that tramways, cables, and electrical machinery generally, contribute to the currents flowing into the mains, and invariably a very heavy kathode (or picking-up point) is followed very shortly by anode points, or areas at which the current is given off again.

We have established definitely that these anode currents are harmless provided the coating on the main is absolutely perfect and intact—several sections have been stripped in anode areas and the coating and pipe found in excellent condition—but such a condition of perfect insulation it is, of course, impossible to guarantee, as even a pinhole is sufficient to start the mischief, and once the coating is gone corrosion is liable to be rapid.

One of the most striking features observed has been the fact of sudden changes of polarity over very short distances. It was natural to suppose that, as the joints and pipes are in fair metallic contact, a current flowing along the main would persist, with gradually changing intensity, for some distance. Such, however, is not the case, and it has been found impossible to interpolate points along a curve with certainty and so obtain readings over longish distances. The reasons for this variability, and rapid change of direction, of the currents have been investigated, and will be referred to later.

Following the course of the mains from the works, it is found that, in general, the condition of the main is kathode on the Wolverhampton, Wednesbury, Darlaston, and Willenhall mains. There are a considerable number of anode points and areas, but still, on the whole, the mains are kathode, particularly the trunk mains. But in the Walsall area the reverse is the case, the anodes predominating, and it is significant that more corrosion has been found in the Walsall area than anywhere else.

Analyzing the various districts, and expressing the results of the readings in percentages we get:

District.	"K" P.Ct.	"A" P.Ct.
Tipton	66·4	33·6
Wolverhampton	65·4	34·6
Darlaston and Willenhall	67·0	33·0
Walsall	33·5	66·5

We are unable to give any explanation as to why, in the Walsall district, the electrical conditions should be so different from the rest of the system, but the fact remains, and is still further brought out

by analyzing the known corrosion spots and expressing the result in percentages per district, when we get:

District.	P.Ct. of Corrosion Spots.
Walsall	48
Wolverhampton	29
Tipton	23
Darlaston and Willenhall	*Nil*

It has been observed, and the point is an important one, that in the majority of cases the branch mains ending inside works act as feeders to the trunk mains (again excepting the Walsall district where this tendency is not so marked), picking up current and charging the main, and further along giving it out and causing anode points and areas. Reference has already been made to the rapid change of direction and variability of the current in very short distances, so that direction may change within a very few feet of (say) a "K" point and become an "A" point, instead of the current curve showing a fairly even pressure and quantity drop along the main. This is particularly noticeable in the town areas where there are a multitude of feeders, and on investigation it has been found that the joints of the pipes do not give good electrical contact, the electrical resistance across a joint being 18 to 20 times that of a similar length of pipe. Consequently, each pipe, in considering the small currents dealt with, is to be regarded as partially insulated from its neighbour. In general, the currents met with in anode areas are of the order of from ½ to 5 milli-amps, and a resistance of 300 milli-ohms, which is the average resistance across a joint, has an appreciable effect. The result of this, in the case of these very small currents where the main is at a higher potential than the ground, is that lateral current dissipation to a good earth is favoured rather than the tendency to equalize potential and flow along the main itself; if proper bonding was resorted to this tendency to lateral dissipation would be greatly diminished.

The analysis of the readings obtained on the ends of branch mains entering the works is as follows:

District.	K P.Ct.	A P.Ct.
Tipton	86	14
Wolverhampton	81	19
Darlaston and Willenhall	83	17
Walsall	50	50

thus showing very clearly the general tendency to act as feeders, except in the Walsall district, where the K's and A's from this source just balance.

Effect of Heavy Kathode Points on Corrosion Spots.

As already stated, the general run of currents flowing along, and in the neighbourhood of our pipelines is from ½ to 5 milli-amps. In several places, however, there are abnormal currents flowing into the mains, and they appear to be directly connected with known corrosion areas. The following are a few typical ones:

Main Kathode Current in Milli-amps.

80 . . . At Cleveland Road, Bilston Road, Wolverhampton.
Result.—Anode area, and several cases of corrosion in the vicinity—*e g*, Portland Place, Waggon and Horses.

400 . . . At Gospel Oak Canal Bridge, and Holyhead Road, Moxley.
Result.—Anode area, and corrosion at Red Frame Colliery between these points.

55 . . . At Bilston.
Result.—Anode corrosion area in Oxford Street, Bilston, in the vicinity.

100 . . . At Wellington Road, Bilston.
Result.—Anode corrosion at Gate Inn, Wellington Road, Bilston.

90 . . . At Wallow's Lane, by Hillary Street, Walsall.
Result.—Ends of bridge tubes corroded where they enter the ground. (Anode area.)

18 . . . At Walsall.
Result.—Anode corrosion at Bath Street and Peel Street in the vicinity.

110 . . . At Blue Lane, Walsall.
Result.—Anode corrosion in Blue Lane.

70 . . . At Brineton Street, Walsall.
Result.—Anode corrosion in Pleck Road and Rolling Mill Street nearby.

The fact of all these heavy kathode points being near known corrosion spots is very significant. There also exist heavy kathode points near which corrosion is not yet known, and it appears probable that it may be expected in the vicinity unless the coating is intact.

While on the subject of these heavy and abnormal kathode points, it should be mentioned that the largest feeding point we have found was at Darlaston, where the readings were beyond the range of our instruments, being over 3000 milli-volts and over 1000 milli-amps, and we were able to light a lamp from the ground current; this heavy leakage appears to be due to the practice of a local firm earthing the positive of an electric welding plant.

It will be seen from this, therefore, that the amount of current flowing into the mains from various sources is relatively large. Fortunately, the main itself is also large, and enables considerable currents to be picked up at points and spread over a large surface. If this were not the case, the anode currents at localized points might be correspondingly heavy, and the rate of corrosion greatly increased.

The verification of the electrolytic corrosion theory may now be given, and can best be substantiated by giving a list of the known corrosion spots along the main, and their polarities as just ascertained; bearing in mind that alternating or anode conditions are conducive to corrosion.

Known Corrosion Spot.	Polarity of Main.
In field at works	K A
Alexandra Road, Tipton, by Pit Mound Syphon	A
Alexandra Road between Pit Mound and 27-in. branch at Horseley Road	A
Red Frame Colliery	A and K A
Oxford Street, Bilston, by Chapel Street	A
Bilston Road, by Gate Inn, Stowheath	A
Portland Place, Wolverhampton	A
Bilston Road, by Waggon and Horses, Wolverhampton	A
Bilston Road, by Commercial Road, Wolverhampton	A
Caldmore, Walsall	A
Hillary Street Bridge, Walsall	A
Wednesbury Road Bridge, Walsall	A
Bath Street, Walsall	A
Peel Street, Walsall	A
Blue Lane, Walsall	A
Pleck Road, Walsall	A
Rolling Mill Street, by Queen Street	A

At Rolling Mill Street, by the Canal Bridge, there is a very strong kathode point of 840 milli-amps, or over 160 times the usual earth currents, with a pressure of 1100 milli-volts. This enormous leakage would be sufficient to swamp the effect of a normal anode current, but there was a time, while we were taking the readings, when this current suddenly ceased, and the main became anode with about the usual anode quantity; shortly after, the heavy kathode current came on again, and the reading was reversed. We are of the opinion from this that the normal state of the main at this point in the past has been anode, and that such would again be the case if the heavy leakage current could be found and removed. It is not possible to prove this, but the leakage is so great that it certainly cannot always have existed, and it is presumably coming from cables or earth connections in the vicinity. It must also be borne in mind that the ground at this spot is very bad, and the clay surrounding the main was, some years ago, condemned as porous, so that the possibility of the corrosion at this point being chemical cannot be overlooked.

However, taking the extreme view that this case is an exception to the general rule, we have the fact that reviewing all the known cases of corrosion *in 95 p.ct. of the cases the main is anode;* and if, on the evidence just given we include this last spot as having originally and normally been anode, then in every single case of corrosion the polarity is anode.

Such an extraordinary number of results all pointing in the same direction cannot possibly be accidental, and this is the main evidence on which we base our opinion that in nearly every case our corrosion troubles are electrolytic.

We may now summarize the results, and from them obtain some idea as to how, at least in great measure, relief from corrosion of electrolytic origin may be obtained.

The main and outstanding points are:

(*a*) Anode condition of main means liability to corrosion.
(*b*) Absolutely perfect coating will prevent corrosion in an anode area; although such coating cannot be guaranteed, nevertheless this point emphasizes the fact that the care taken over the coatings in the past was absolutely essential and must be continued in the future. Had this care not been taken, corrosion would have been more general and rapid.
(*c*) The joints of the main cause it to be a bad conductor and partially insulate it length from length, preventing an even flow of current along it, causing constant variations in electrical conditions, and favouring lateral dissipation to earth through imperfections in the coating.
(*d*) Heavy kathode points invariably give rise to anode points in the near vicinity.
(*e*) Branch mains from works, syphons, valve bodies, and spindles, and all castings being uncoated, afford the principal means by which currents charge the mains.

Recommendations.

(*a*) The greatest possible care should always be taken to see that the coating is kept as perfect as possible.
(*b*) Earth bars fitted in good electrical contact with the main should be attached and sunk at all corrosion and anode areas, going well down into the earth below the main to good moist ground, or if this is not practicable, terminating in an earth plate and some coke-breeze saturated with water. All earth bars after fitting should be tested to see that they are functioning properly, and not adding resistance at the points of attachment.
(*c*) Bonding should be resorted to wherever practicable. Whenever new mains are laid each joint should be bonded and earth bars fixed at intervals; this would probably then keep the whole main permanently in good electrical condition. In the case of the mains already laid, the expense obviously prohibits this; but the more it can be done, when portions of the main are laid bare, the better, in order to link up as many pipes together as possible, and thus reduce the number of earth bars necessary to make a satisfactory job.
(*d*) The evil after-effects of heavy kathode points might be minimized, when they can be definitely located, by taking steps to remove the leakage or giving it an easy path to earth before it reaches our main. But inasmuch as the precise location is generally a matter of difficulty this method cannot be expected to be of general applicability.

In conclusion, the full results of the investigation have been plotted on the maps of the various districts, and the magnitude of the readings at all points entered up, so as to be available for future reference; and these should be of considerable use in predicting and determining points at which corrosion may, or may not, be expected.

(*To be concluded.*)

THE "JOURNAL" TECHNICAL RECORD

Which also contains Full Reports of Meetings of Gas and Allied Associations ———

Manchester District Institution of Gas Engineers

About ninety members attended the meeting of the Manchester Institution held on Friday, July 11, at the Bolton Town Hall, where they were welcomed by the Mayor of Bolton, Councillor R. E. Roberts, J.P.

Mr. W. J. SMITH, the President, on behalf of the members, thanked the Mayor for the kind reception accorded to them. He then called upon Mr. James Lomax, A.L.S., F.G.S., M.I.M.E., Palæo-Botanist to the Fuel Research Board, to give a lecture entitled "The Microscopical Examination of Coal in Relation to the Production of Gas and Coke." Mr. Smith remarked that Mr. Lomax was a Bolton man of whom they were very proud, and he had made a lifelong study of coal.

MICROSCOPICAL EXAMINATION OF COAL.

By J. LOMAX.

Mr. Lomax then gave his lecture, which took the form of a commentary upon a large number of lantern slides. He said the microscopical examination of coal in combination with chemical analysis yielded information which ought to be of great use in the selection of coals for particular purposes, such as gas production and coke making. Coal was once living vegetation, and traces of its origin were discernible when a microscopical examination was made of the substance into which it had been converted. Even where superficially it appeared to be structureless, plant tissues could be detected. Its quality was determined by the presence in varying quantities of the four ingredients which research had shown constituted coal—clarain, durain, vitrain, and fusain. Clarain was so named because of its brightly-banded and finely-laminated appearance in the block, and its clearness when examined by the microscope. It was composed of many constituents—leaf tissues and cuticles, resinous seed-like bodies, fragmentary portions of stems and twigs, and a few spores.

Durain owed that name to its durability and toughness. It was fairly hard and usually more or less laminated, the laminæ being formed of alternating layers of microspores and megaspores with occasional leaf cuticles. Often there were prodigious numbers of microspores with comparatively few megaspores, which showed that the coal substance in that particular locality owed its origin mainly to the shedding of the microspores from the fructiferous cones of some species of the *lepidodendreæ*, the cones of which contained one kind of spore. Where the megaspores were in large numbers the coal substance owed its origin to cones which contained two kinds of spores. The numbers were immense. By calculation he had ascertained that in one cubic inch in a section cut from the Trencherbone seam there were 36,000 microspores and 6500 megaspores. That was about the average in a Lancashire durain or hard spore coal. Some seams contained considerably more.

Vitrain had a glassy or vitreous appearance, and occurred in more than one form, but principally as lenticles of varying dimensions resulting from the vitrainization of fairly large seams and branches of forest trees. Flattened stems appeared in the coal as long bands of considerable length. Another form was produced by micro-fungial and bacteriological action converting the original plant débris deposit into pulp. When sections were examined microscopically abundant evidence of this process could be detected. The broken down remains of more resistant bodies were found isolated in the structureless matrix of the once vegetable pulp. Indeed, all the vitrainized substances were the result of the breaking-down of the leaf tissues and other non-resistant vegetable humus which lay between the bands and the laminæ of the more resistant substances.

Fusain was formerly known as "mother of coal," "soot," and "smudge." It was soft, rarely solid, and soiled the fingers when handled. In appearance it resembled black rotted wood. It was always more or less fibrous, and it was probably the broken-down remains of the inner and outer cortical layers of stems. It was frequently associated with pyritiferous matter. It then formed a substance which easily oxidized, and was probably a factor in causing spontaneous combustion.

These four ingredients occurred in all seams in varying quantities, and a preponderance of one or the other determined the behaviour of the coal on carbonization. Clarain and vitrain gave off a large amount of gas, but were too fatty to make a good coke. Sometimes they swelled to as much as three or four times the original bulk, and under certain conditions the swelling would block up the retorts. Durain of itself would not form a coke, it broke up into breeze; but a suitable mixture with clarain or vitrain produced a good coking and gas coal. The Arley seam in Lancashire was an example. By artificial blending the same results could be obtained.

In any case a microscopical examination of the coal in a particular seam gave a good idea of what would happen when that coal was carbonized. The proportions of the ingredients might vary in the same seam with a change in locality. On the other hand, a similarity in the constituents might extend over a considerable area irrespective of whether the bands and laminæ were thick or thin. This had been established by the examination of seams in the Lancashire coalfield from east to west. Almost invariably the bottom of a seam was composed of bright looking soft coal containing thick or thin bands of a vitreous character. This was usually followed by bands and zones of the clarain type composed of numerous leaf laminæ with here and there laminæ composed of microspores or megaspores, which gradually increased in number until the seam became a spore or durain bed 1 ft. or more thick. In some places the spore content then gradually decreased until the upper portion of the seam resembled the bottom. Or it might be that bands of inferior coal and dirt of variable thickness occurred; then the coal substance above was soft, bright coal, similar in composition to the softs in the beds below. After these softs, the microspores and megaspores came in again, and gradually increased until another durain band was formed; so that in the same seam two or more durain beds might occur. Hence the names of "bottom softs" and "hards," "middle softs" and "hards," and "top softs" and "hards," denoting varieties of coal coming from the same seam. These conditions were found in the majority of coal seams, especially the thicker ones.

In a few seams a balance occurred between the durain and the vitrain and the clarain. Two such seams were the Lower Mountain of the Burnley District and the well-known Arley in the Tyldesley, Wigan, and West Lancashire District. It was well known that these seams supplied excellent gas and coking coals. The same could be said of several Yorkshire seams, notably the Silkstone, the Parkgate, and the Halifax Hard. But the seam which he had examined more in detail than any other was the Trencherbone, about the best known and most useful coal found in the Lancashire field. It showed all the characteristics which had been mentioned in the description of the origin of the vegetable débris and the building up of the four ingredients. In some localities it was over 9 ft. thick, and consisted of three beds; in other places there were only two beds, and the thickness did not exceed 4 ft.

Several of the slides showed how carbonization affected specimens of coal taken from various seams.

Mr. Lomax also produced a graph, in which lines of varying length indicated the relative quantities of spores found in different portions of the same seam. The spores, Mr. Lomax said, differed in their nature and distribution. For instance, certain kinds would be found in a middle seam and be absent from the lower and upper seams. These differences helped in the correlation of seams of coal. Valuable information was also got from the study of the coal balls or petrifactions which were found in certain seams, sometimes isolated, sometimes in groups. They were more or less oval in shape, laminated, and were composed of various carboniferous plants, some whole, and some fragmentary. In the surrounding coal similar plant remains were found. The evidence indicated that the normal course of decomposition and compression had reduced the original thickness of the peat-like deposit to about one-twentieth—that is to say, 20 ft. formed 1 ft. of coal. In many of the larger balls were found fragments of stems and roots which must have been more than 2 ft. in diameter, and the form of the cellular tissue was well preserved. Such specimens lay in a matrix of remains of small plants of various species.

Another series of slides illustrated the plant remains found in

the coal. Mr. Lomax remarked that the remains of fishes were seldom found in the coal itself; more often they were present in the shale. As a rule they were the remains of fresh-water fish.

The CHAIRMAN said he wished to say a few words about the work which Mr. Lomax was carrying out. Many gas engineers in Lancashire had obtained from him cabinets which contained samples of the four ingredients which had been described, and micro-sections of specimens of coal taken from seams which were identified. Much interesting and useful information could be obtained from the inspection of these; and he recommended the members to follow the example of those who had encouraged Mr. Lomax in his good work by purchasing specimen cabinets. In his view scientific research of this kind was of great importance to the gas industry in order to ensure the proper selection of coal for particular purposes. Coal with a maximum durain content would be the best for boiler purposes, but for the production of gas and coke they wanted coal which contained clarain and vitrain in suitable proportions. Another point of interest was the preparation of the sections of coal for microscopical examination. Obviously that was by no means easy, and at one time it was very costly. Thirty years ago it was difficult to obtain such sections of the size of a thumb-nail. Mr. Lomax was able to produce now probably the largest sections ever obtained for ordinary purposes; the most convenient size was 3 in. by 3 in., but in special cases they were as large as 3 in. by 8 in.

VOTE OF THANKS.

Mr. R. H. GINMAN (Leek) said he felt it was a privilege to renew his acquaintance with Mr. Lomax, whom he had the pleasure of hearing thirty years ago at St. Helens, when a meeting of the Institution was held there under the Presidency of Mr. Samuel Glover. As gas engineers they all appreciated the many hints for their guidance which were contained in the lecture; and they would all go away feeling that they had learned a little more about coal. He was sure all the members would join in voting their thanks to Mr. Lomax.

Mr. F. G. SHAW (Buxton), in seconding the motion, said he also remembered the occasion to which Mr. Ginman had referred. On that occasion one of the principal questions raised was about the preparation of the sections. He did not know whether Mr. Lomax had disclosed to the scientific world the exact method he followed, and he did not suppose that gas engineers would be able to get as satisfactory results as Mr. Lomax did with his long experience, but still he would be glad if Mr. Lomax would give them some information about the preparation of the sections and the methods he adopted.

Mr. LOMAX said he would be very glad if some simple method was devised of testing the suitability of coal for carbonization purposes. Once he said to a well-known Labour man, after a reference to Ruskin College, at Oxford, "It would be a good thing if you could turn Ruskin College into a place where you taught colliers to get coal and not dirt." That man had never spoken to him from that day to this. It could easily be done. It could be done on the surface, and it could be done below to a great extent. The Lancashire and Cheshire Coal Research Association were having various collieries visited, and samples taken with the object of procuring information which would be used by the coal owners who were members of that Association. It struck him that it would not be a bad idea if gas engineers did something on those lines. The coal owners would be glad to co-operate with them in getting samples of coal and making investigation as to the best use to which that coal could be put. One fact ought to be kept in mind. Lancashire coal seams were being worked out. However, there were still many thin seams, and they would have to be made use of when the rest were done. It was time that those thin seams were investigated. In that direction the Lancashire and Cheshire Coal Research Association had done useful work, and detailed information had been given to the Government; but it was pigeon-holed, and some years might elapse before it got out to the public. As regards section making, he did not advise anybody to commence doing that. The preparation of a coal sample prior to making a section was an important point. The coal had to be heated in order to get it to adhere to the glass, and the heat caused trouble through the emission of gas. However he had been able to devise a way of getting over that difficulty.

Mr. G. S. FRITH (Runcorn) said that before the members separated, he wanted to draw their attention to the fact that Mrs. Smith, the mother of their President, was in her 99th year; and he suggested it would be a graceful tribute to send her a message from the Institution. He moved a resolution to that effect.

Mr. CHARLES WOOD (Bradford) seconded the resolution, and it was agreed to unanimously. The telegram sent was in these terms: "The Manchester District Institution of Gas Engineers, of which your son is President, assembled in Conference in Bolton to-day, in the ninety-ninth year of your age, send you hearty greetings and congratulations."

THE LUNCHEON.

The members were the guests of the Bolton Corporation Gas Department at a luncheon served in the Town Hall. Councillor T. GLAISTER, J.P., Chairman of the Gas Committee, presided.

Councillor R. E. ROBERTS, the Mayor of Bolton, proposed the toast of "The Manchester District Institution of Gas Engineers." He said this duty was allotted to Councillor C. H. Beswick, the Vice-Chairman of the Gas Committee, who had been called out of town and had asked him to take his place. He felt that he was a poor substitute, and, moreover, he was one of the opposition, because he was the Chairman of the Electricity Undertaking in Bolton. [Laughter.] However, he believed the electricity and gas undertakings could be run successfully in co-operation; it would not surprise him if at a future time they were merged together. He believed that there was a great future for the distillation of coal, and that the gas industry would continue to be successful; and he heard with pleasure that the Manchester Institution, formed as far back as 1870, was carrying out upon scientific lines the excellent work of training youths to give service to gas companies and municipal gas undertakings.

Mr. W. J. SMITH, in responding, said the Institution had done good work in the past, and there was every reason to believe it would continue to do good service to the gas industry. The Mayor had told them that science and industry must work together hand-in-hand. Their recognition of that truth was shown by bringing in the Leeds University to assist them in conducting research not only in the manufacture of gas but also in the apparatus in which gas was consumed. All industries, he thought, would find it advantageous to ally themselves with Universities in that way. Also, colliery proprietors in particular should pay more attention to the work which was being done by Mr. Lomax in the selection and grading of coal.

Col. W. M. CARR (Stretford), in proposing the toast of "The Bolton Gas Department," said his acquaintance with the town was very limited, but he knew it had a most excellent Gas Department, and that its Gas Engineer had been very active in the service of the Institution. They all knew the time and labour Mr. Smith had given to the Commercial Section. He believed Mr. Smith was the first official of the Bolton Gas Department to occupy the Presidential Chair of the Institution. Mr. Harrison Veevers, their third President, he believed, was a Bolton man, but not an official of the Corporation. Since those days the Bolton undertaking had developed very greatly in spite of adverse circumstances. To-day, although like all public services affected by the terrible trade depression, the undertaking was in a state of efficiency which had never been equalled previously. Its results were comparable with the best gas undertakings in the country. The Mayor had referred to electricity and gas co-operating. His own opinion was that the gas people had always been ready to walk hand-in-hand with their electrical competitors; they asked only for a fair field and no favour. They acknowledged that electricity was a serious rival in the lighting field, but in the heating field, particularly for domestic heating, gas gave better service—necessarily so from the economic point of view. In methods of charging, gas undertakings were behind their electrical rivals; they were subject to restrictions of precedent and legislation, and they had not the same facilities to negotiate terms with the big consumer. However, it was hoped that those restrictions would be removed. They had to educate the public and get the small consumer to see that he would benefit in the long run if the very large consumer got his gas at a lower rate.

The CHAIRMAN replied to the toast. He said there could be no doubt that Institutions of this kind did a great amount of good work, especially on the educational side. In business generally rule-of-thumb methods were being abandoned; matters had to be looked at from a scientific point of view, and Bolton was not lagging behind. The gas-works was as efficient as any in the country, an example of what a gas-works should be; and the Engineer was known to be a very able man. The history of the Bolton gas undertaking began in 1818, when the Bolton Gaslight and Coke Company was formed. In 1872 the undertaking was taken over by the Bolton Corporation, and his grandfather was Chairman of the Gas Department in 1874. He himself had been Chairman for about eight years. Competing with it was a well-organized electricity undertaking which produced current at less than a penny per unit, including all costs; but, in spite of that competition, the Bolton Gas Undertaking last year supplied 450,000 million heat units for the domestic load, against 30,000 million heat units supplied by the Electricity Undertaking for domestic purposes. He quite agreed with the Mayor that both undertakings should work together. Both were up against a serious problem in connection with the housing schemes, private and municipal. The working man could not afford to consume electricity and gas in quantities which would repay the departments. So both were losing money in these housing schemes. In 1923 the showrooms were re-organized with such effect that the output of apparatus went up 70 p.ct. straight away. On an average, 3000 appliances were supplied each year. The consumers numbered 55,700; 50,000 were domestic users. There were in service about 17,000 cookers and 17,000 wash-boilers.

VISIT TO THE BOLTON GAS-WORKS.

After separating into several parties, the visitors were conducted through the gas-works by members of the staff. In the laboratory Mr. Lomax and his Assistant were in attendance to supply information; and specimens of Mr. Lomax's work were on view.

In the works many features of interest were noted, among them "Askania" and "Arca" regulators, and the "Bolton" sloping bar grate producers. Attention was directed to the Bailey meters and the Fairweather calorimeters. The structural design, the general layout, and the care taken to secure accessibility, were all matters of which note was made.

At the end of the visit the visitors once more enjoyed the hospitality of the Department, who provided them with tea.

The Institution and the University, Teaching and Research

Reply to the Discussion on Prof. Cobb's Paper

Prof. Cobb wrote in reply to the discussion on his paper at the annual meeting of the Institution of Gas Engineers in Leeds last June:

Sufficient time has now elapsed to allow of written contributions to the discussion coming in, and I should like to say in answer to all who have taken part how appreciative I am of the way in which this paper has been received. I must acknowledge with gratitude the kind things said respecting my own services, and I would like to do that at once, repeating what I said in the paper as to how important a part has been played by my staff, and by the Chairmen of Research Committees.

All the contributions to the discussion on the Tuesday morning added something to the sum of knowledge and informed opinion on the subject, and the same applies to what was forthcoming in writing from such authorities as Dr. Lander and Dr. Sinnatt.

There is apparently a consensus of opinion that the conditions of to-day (and to-morrow) in Gas Engineering make thoroughly scientific training for the profession essential. Research work is of the utmost importance, but the training of men at University standard, who will become the research workers, and the executive officers of the future, stands as a paramount necessity.

It was good to hear Sir Arthur Duckham so rightly emphasizing the imaginative quality which work of the highest class must possess, and insisting on the liberal training which should develop the faculties of imagination and precise observation.

Professor Smithells referred, in his inspiring speech, to the great advantage which an institution for research and teaching in technology finds in its association with a University, and I cannot endorse too warmly what he had to say of the benefit arising from continual intercourse with scientific men and scholars in other Departments of the University, who give so willingly of their knowledge and counsel.

Dr. Smith insists on the necessity of keeping abreast with modern ideas and practice. There are different ways in which that is ensured in our own Department, one of the most useful being the provision of special courses given by lecturers holding responsible positions in industry. Moreover, the Department is provided with an Advisory Committee, on which the Institution of Gas Engineers and the Society of British Gas Industries are officially represented, and containing in its membership other industrial leaders. Dr. Smith refers also to the newly acquired chartered status of the Institution, and presumably has in mind the accompanying responsibility for the recognition of all that is best in the science of modern Gas Engineering, essentially a new profession, as pointed out in the paper, created by the necessity of bringing the full resources of chemical and engineering science to bear on the utilization of coal. This responsibility is fully appreciated by the University also, which can take no limited view of its function in the training of entrants to the profession of Gas Engineering and in the study of Fuel Technology.

The question of tuition by correspondence, as raised by Mr. Blundell, has been discussed during the last few weeks in the Press. It is plain that members of the staff of a gas undertaking isolated geographically from teaching centres are placed at a disadvantage which should be minimized. It would, however, give an entirely wrong impression of what University training means and can do for a man, to pretend that it could be conveyed by correspondence courses. The vital things are personal teaching and influence, laboratory work done with carefully selected apparatus, under skilled supervision, and the contact with teachers and students of allied (and remote) subjects in other departments and in the general University life. None of these can be touched by correspondence, which does something different by entirely different methods.

Street Lighting*

By Prof. Dr. J. Teichmuller, of the Technical High School at Karlsruhe.

The problem of street lighting is extending and increasing in importance year by year—I am almost tempted to say day by day—owing to two causes, between which no direct connection exists. On the one hand, the need for adequate street lighting becomes more and more pressing as traffic gets heavier and faster, and, on the other hand, the technical possibilities of producing adequate street lighting are increasing.

These two points have been the determining factors in the history of street lighting for a long time past. In former centuries there was no heavy night traffic requiring good street lighting, while the technical possibilities of producing such lighting were also absent. The last century saw the rise of both, as well as the development of something like a street lighting technique. The birth of this technique may perhaps be fixed towards the end of the 18th century, when that great Frenchman, Lavoisier—who is not undeservedly described as the father of the science of chemistry—embarked on an extensive investigation concerning the lighting of streets in large towns. The invention of gas lighting by Murdoch (in the year 1802) and the employment of gas for street lighting were important steps in the right direction. However, for many decades afterwards progress was extremely slow, and even the invention and introduction of the electric arc lamp and incandescent lamp in the 'seventies and 'eighties of last century resulted in no substantial advance. Throughout that long period of time the question of street lighting received but scant attention, and the kind of street lighting technique to which I have just referred did not, as yet, embrace the technics of illumination. Illuminating engineers confined themselves to improving light production by chemical and electro-technical means—that is to say, they merely practised the technics of the *burner*, so that, from the point of view of the technics of *illumination* their only task was the selection of lamp sizes, suspension intervals, and, sometimes, suspension levels.

The technics of illumination in the true sense of the term did not begin until the 'nineties, when my German countryman, Uppenborn (who, to the best of my knowledge, was the pioneer) prepared detailed projects for the lighting of streets and squares, and published articles on the subject.

Naturally, the question very soon arose, In what way are we to estimate the value of the lighting of a given street? At first this question resolved itself into the one point whether the horizontal or road surface, or whether a vertical surface, should receive preference—that is to say, whether horizontal illumination (say) in the road axis, or whether vertical illumination should be made the basis in judging and estimating value. This was the only question discussed, at least in Germany, for a considerable time, and it is very interesting to recall the arguments advanced.

Horizontal or Vertical.

One side held that no greater demand could be made on the street lighting than when searching for an object, such as a coin, which had been dropped to the ground and that, therefore, horizontal illumination was all that mattered; while the other side contended that good vertical illumination was the thing to be aimed at, because nothing was more important than that inscriptions on the walls of houses, such as street names and numbers, should be legible. In this connection it is a remarkable fact that horizontal illumination was advocated by electrical engineers and vertical illumination by gas experts, and that, at the same time, electric light, and notably the direct-current arc-lights almost exclusively employed at that time, came off best if a given street was judged by its horizontal illumination, while gas light won if the estimate was based on vertical illumination.

Uniformity (or lack of uniformity, as it was referred to at the beginning) was the next factor considered in relation to the value of street lighting, and opinion was divided on this point as well. Some took it for granted that street lighting must be as completely uniform as possible, while others held the view that some more or less dark areas made no difference, and that the important thing was that there should be a few points in the street, such as the areas under the lamps, where (say) a time table could be consulted, should the need arise.

Two very significant and noteworthy facts emerge from these discussions. One is that the intensity and uniformity of street lighting, the two basic values which still occupy first place in any consideration of the subject, had already come up in the early days of scientifically considered street lighting. The other fact is that these two values are of a purely physical nature and are capable of being measured or calculated. This physical treatment of illumination dominated the era of lighting technics in the narrower sense, and a new era was ushered in when the technics of light and, in particular, the technics of illumination, began to be approached by the physiological method. That was, allowing for differences between the various countries, from about 10 to 20 years ago. It is a matter for surprise that this could take such a long time. Yet there is an explanation, and it lies in the fact that this new technique, which was developed by technically trained men, was also linked up as a branch with the great body of general technics.

* Paper at the Holophane Conference, London, July 7 and 8.

The engineer only regarded the problems before him as tasks to be treated physically and mathematically. That was why the problem of lighting was approached and treated in a way which was entirely wrong, why we were in the dark for so long, and why we are even now frequently unable to discard this physical method of approach.

It is all the more necessary to emphasize to-day that the eye is not merely the only light receiving apparatus, but that, apart from that, it is the eye which converts the radiating physical energy into light. For without eyes there is no light. Thus everything depends on the way in which the eye converts the physical stimulus into light and conveys the latter to the consciousness. The great task of answering this question, or wide complex of questions, is before us now, has been before us for some years; and the more of these questions we answer, the more does this complex of questions appear to extend and deepen. We must admit that we are really at the very beginning, that we have only just begun, by means of theoretical investigation and consideration, to establish the principles which must necessarily be laid down for the technology of light.

Empirical Progress.

We see here, in the development of the technology of light, a reproduction of the conditions which we observe in the case of almost any technology—namely, that a technology is created by supplying a theoretical foundation to the primitive form of a craft. Having become economically productive, the latter advances in a more or less crude empiricism, and theory must follow, to supply a foundation for empirical achievement and to pave the way for further progress. Naturally, empiricism and theory must be supported by measurement. The easier and, therefore, the more numerous these measurements are, and the more reliable their results, the greater may be the degree of empirical progress. These considerations, which apply to technology in general, will also explain the peculiar position in which the technology of light and, in particular, the technology of street lighting, finds itself to-day.

The technology of light possesses, in the human eye, an extremely sensitive and many-sided measuring instrument, which is unsurpassed in every respect, and every sound human being possesses this measuring instrument and knows how to use it, even though with varying skill and results. This popularity of the light measuring instrument called " eye " explains a fundamental difference between light technology and all other technologies and also explains why light technology, more than other branches of technology, has developed and will continue to develop, by leaps and bounds, in the sense that empiricism has anticipated theoretical consolidation and that theoretical justification is paving the way for further progress. The unprejudiced human eye, like an incorruptible judge, has even rendered to light technology the great service of revealing the errors under which the expert had laboured for a long time. Frequently the eye refused to recognize as good an illumination which had been designed and executed according to the experts' best principles. This fact supplies the key to the physiological era of lighting technology—that is to say, to its development in recent years, and especially does this apply to street lighting. From the literature and from the national and international conferences the fact emerges that, to paraphrase Goethe, there are two souls in combat in the expert's breast, the physical and the physiological—consciously in the case of some, and less so in the case of others. With some the conflict is deep and definite, with others it is indefinite and superficial. One man, an engineer to the core, bases his judgment of street lighting entirely, or at any rate, substantially, on the physically measurable, and works out his projects accordingly. The other man senses the conflict between his prejudiced expert judgment and the perceptions of the unprejudiced natural man, and he therefore endeavours to depart more and more from the physical method of approach and to evolve in regard to street lighting a direct psychological and æsthetic view based on physiological factors.

Too Much Attention to Individual Features.

There can be no doubt, in my opinion, that before long we will all follow the latter expert's example and that our only care will be to light a street " well." Everyone will admit that. But if I should be told that this has always been the experts' aim, and that, particularly in recent years, this object has been borne in mind with more than ordinary care, then I would have to differ. For far too much attention has been devoted to the individual features of lighting quality to establish clearly, first and foremost, what significance actually is and ought to be attributed to the concept " quality of street lighting," and, in the second place, what importance should be attached to the individual features of lighting quality in relation to the concept as a whole.

The last international discussions, notably those held at Saranac Inn in September, 1928, are undoubtedly of considerable value, and I would not dispense with them. Nor have I the least desire to criticize them. On the contrary, I take these pronouncements of the greatest experts in the world as a definition of the position in which the question of street lighting now stands. And this position is, approximately, as follows: Among the features constituting the quality of a given street lighting by far the greatest prominence is given to lighting intensity and uniformity of the lighting intensity—a prominence, in fact, which, in my conviction, is far in excess of the true importance of these values. Lighting intensity was the principal object of the Saranac Inn discussions; the question of which lighting intensity required attention was gone into—whether only the horizontal, or the vertical as well; whether the axial horizontal or the narrowest was most important; at what level the horizontal lighting intensity should be measured; and whether the latter should be applied in judging a given street lighting, or whether it should only be applied for the classification, or graduation, of the street lighting. Further discussions concerned the significance of the uniformity or lack of uniformity of the selected horizontal lighting intensity, and a few remarks were also made concerning specific consumption and lighting exploitation. All the other contributory factors to street lighting quality were, as a matter of fact, only referred to casually, and most of them were referred back, by resolution, as matters which were not yet ripe for discussion by the international conference. This procedure holds a great danger—namely, that the same great importance will continue to be attached to the lighting intensity of a horizontal plane as it possessed for a long time and still possesses to a certain degree. Yet no one could seriously dispute the fact that a given street lighting with a lower horizontal lighting intensity may, in certain circumstances, far excel one with a higher horizontal lighting intensity and that such cases may occur quite frequently.

If the intensity of the horizontal lighting should continue to be kept in the foreground, then it is inevitable that other values, especially the economic values, should also be related to the horizontal lighting intensity. This danger threatens, at any rate, in the selection of the *mean* (original may also mean " axial ") horizontal lighting intensity.

A Definition of Good Lighting.

Having so decidedly insisted that good lighting should be made the sole criterion in judging a given street lighting, that this is the only goal to be kept in view in designing and executing a street lighting installation, and that, consequently, all the values and, more generally, all the circumstances which are likely to contribute—either in a positive or in a negative sense—to the excellence of the street lighting should be carefully examined with a view to determining the extent of their influence, I shall no doubt be expected to supply a definition of what I desire to convey by the goodness of street lighting. There can only be one answer to that question:

> A street is *well lighted* by artificial light if the moving and fixed objects in the street can be perceived with the same or similar clarity and in the same or similarly attractive form by such illumination as by fairly good (" not bad ") daylight illumination.

Even if we have to admit at the outset that perfect street lighting, according to this standard, will not be accomplished in the near future, or perhaps ever, this definition nevertheless defines a clear goal towards which we ought to strive. How is this to be achieved? The answer to this question can be found in one of two ways. One is empiricism guided by the direct judgment of the sense of sight; and the other, a scientific investigation of all the factors which contribute to goodness in lighting, a systematic examination of their action, individually and in co-operation, and of the extent of their influence on the quality of the lighting as a whole. We, as engineers, will have to follow the latter way and must only take the first if we find that the second is too slow a route to our goal. To-day, while we have made so little progress on the second route, this may very frequently apply. And it is even necessary—that emerges from our preceding considerations—to invite the criticism of the unprejudiced eye again and again in respect of everything we achieve by scientific means, especially in order to guard against over-estimating an individual feature of lighting quality.

We have not been idle in our investigations of the influences affecting lighting quality. In Germany we went about our task in this way that, first of all, we translated, so to speak, into light technology the large number of valuable works published by our great sense-physiologists, often without any recognizable practical object. I would recall here the researches of Helmholtz, Konig, Nagel, and Kries. During the last few years Mr. Ludwig Schneider, a former Assistant at my Institute, made valuable contributions to this subject. After a thorough study of the German, English, French, and American literature, he established five basic perceptions which may be of importance in connection with perception in the street. They are: Difference perception; form perception (including keenness of sight); speed of perception; speed of difference perception; and, finally, speed of form perception.

On the basis of these and their dependence on the lighting intensity, and on other factors, he has attempted to establish certain rules for the lighting of arteries of modern traffic. I think that these investigations deserve every attention, because, although they do not and do not pretend to represent anything final, they point the way to a better understanding of the demands which must be made on modern street lighting and by

which we designing and constructing engineers will reach the ideal of good street lighting. In the manner referred to here we shall have to continue to study the basic perceptions and supplement them. In time, these will provide us with an exact picture of the features composing the quality of a given street lighting. Many more intensive investigations will be required for the purpose, among others concerning the effect of an uncompleted adaptation on the various speeds of perception. Considerable attention must be paid to peripheral perception, as in view of the speed of modern street traffic peripheral perception really plays the part of visional warning. However, at present this peripheral vision is not applied any more in the sense that the warning object—(say) a motor car—is held in view, but one is generally compelled to fix clearly the goal of one's own locomotion, while, at the same time, drawing certain conclusions from the peripheral perception.

In view of the present uncertainty concerning the physiological principles and their effect on the lighting quality, it is very difficult, if not impossible, to lay down indisputable rules for street lighting. Nevertheless, we feel forced to do so, because an industry and technology possessing no recognized objects and rules will, as Mr. C. C. Paterson correctly observes, always have to suffer on that account, as the supplier and buyer of a street lighting installation cannot, without such rules, reach an understanding with regard to the standard by which the installation should be judged. The scant success of the international exchange of views at Saranac Inn is not a matter for surprise. No agreement was reached even with regard to drawing a distinction between the valuation and graduation of a given street lighting, as suggested by Mr. Paterson. To me this distinction seems important, and the idea of graduating according to the lowest horizontal lighting intensity appears very questionable. At all events, according to this, two classes of streets could be distinguished immediately—that is to say, those in which the street lamps serve more to light than to illuminate—*i.e.*, to indicate the direction of streets and crossings as signal lights, and those streets in which the object of obtaining proper street illumination has been pursued and achieved.

The Physio-Psychological Influence.

Only where this is the object in view does it pay to estimate, according to quality, of course, the value of the street lighting. If, as has been the practice in most cases up till now, we should wish to do this mainly according to the intensity of the horizontal lighting, then I am afraid we should be on the wrong track—a track against which Mr. Preston S. Millar has issued an emphatic warning, because the return journey is extremely difficult. We shall be compelled to devote far more attention to the physio-psychological, and finally the æsthetic, influence of lighting.

From the æsthetic point of view it has always struck me, in a disturbing way, that for street lighting lights of axial-symmetrical shape and axial symmetrical light distribution are almost always employed, whereas, on the one hand, the elongated shape of streets demands illumination by non-axially-symmetrical light distribution, and, on the other hand, the street fronts are broken by the hyperbolically bounded shadows which it is impossible to bring into harmony with the architecture of the house frontages.

Among the constructions with which an asymmetric light distribution adaptable to the peculiarities of the street can be achieved, the Holophane Company's product is the most successful, as well as the most interesting theoretically.

It would be highly desirable to have frequent opportunities of contrasting different lighting installations in this way, observing the effects of "lighting quality" and, as experts, thus to receive an impulse to consider to what individual causes of a technical, physical, physiological, psychological, and æsthetic nature the quality of the lighting is to be ascribed. That would always lead to speculative and experimental investigations concerning the variability of the concept of lighting quality according to the character of the street.

Science in the Service of Illuminating Glass Manufacturers*

By S. English, D.Sc.

At our previous International Conference in June, 1927, I ventured to deal in a general way with certain features of illuminating glassware, and to suggest ways in which these features or properties could be controlled or modified to suit the varied requirements of illuminating engineers in different parts of the world.

Since that time we have had an opportunity of putting some of these suggestions into practice, and as a result, we have been able to improve the quality of British-made Holophane glassware in several important respects without at the same time causing a serious deterioration in any essential property. In other words, we have to report a general, all-round improvement in our ordinary glassware, and also certain new developments which may be of interest. In considering these improvements it is proposed to consider first visible properties, and later to pass on to a consideration of certain invisible properties.

Colour and Brilliancy.

It was mentioned in a paper presented at the 1927 Conference, that even though very great care be taken in the selection of the raw materials for the manufacture of our glassware, it was impossible to obtain them in a state of chemical purity. Sand and lime, which constitute 80 p.ct. or more of the finished glass, are natural products and always contain a certain amount of iron oxide which gives to glass the familiar greenish colour. This green colour is usually covered up by the addition to the glass of a complementary pinkish colour, due to manganese dioxide. Thus a decolourized glass, instead of containing no colour at all, actually contains two colours, but they are so proportioned as to neutralize each other. The result is that the glass absorbs light uniformly throughout the whole range of the visible spectrum and has really a pale grey shade. It is obvious that if the depth of the green colour to be covered up is reduced by one-half, and the neutralizing colour is also reduced by one-half, the total absorption is correspondingly reduced—*i.e.*, the glass is less grey. Such a glass has a lighter and brighter appearance. During the last three years we have been able to improve the colour and brilliancy of our British glass in this way. In 1926 we used to use 14 oz. of decolourizer to each batch unit. To-day, as the result of a series of changes we have made, it is only necessary to use 9 oz., or even less, of decolourizer per unit of batch. This has given us a distinctly brighter glass—one with as good a brilliancy and as much sparkle as many samples of table glassware.

* From a Paper before the Holophane Conference, July 7 and 8.

Annealing.

During the last year we have been actively engaged on the perfection of the annealing of our glassware, more particularly with a view to removing the possibility of occasional lapses due to circumstances over which the glassmaker has little or no control—*e.g.*, a strong wind in an unfavourable direction may cause irregular variations of temperature down the lehr unless special precautions are taken to counteract its effect—or something may unaccountably go wrong with the firing. We have achieved some success in this direction, and we are still pursuing the problem in the hope that we shall soon be in a position to guarantee good annealing without any lapses and irrespective of adverse climatic or other conditions.

During the last four years, the power to resist variations of temperature of our ordinary glassware has been improved by about 50 p.ct.

Heat-Resisting Glass.

For certain purposes even the improved quality of our ordinary glassware is not good enough. For example, we wish to assist the lighting of streets by gas in the same way as we assist electric street lighting, but obviously special units have to be employed for this purpose. These units must be made of a really good heat-resisting glass. As a first step, a curved plate with prisms on both sides was designed to fit inside the square type of street lantern and give a directional lighting effect. Our French Company produced these in a heat-resisting glass called "Bozal." These plates were designed for use with two, three, or four No. 2 mantles. So far, not one case of breakage due to heat—when properly installed and used—has been reported. Certain people have tried to cause these plates to break by using them with more than four mantles. In one case a 12-mantle burner was used; in another the glass sides of the lantern broke; but the plates have always stood the tests. This glass ("Bozal") has also found a field of usefulness in floodlight front lenses and for large size reflectors to be used with powerful lamps.

More recently a circular one-piece directional refractor for use inside circular street lighting globes has been designed. These circular lanterns with 9 in. globes generally have from 4 to 6 mantles. To withstand this heat, a refractor of circular form must be made of special heat resisting glass—even harder than "Bozal." Our British works have been experimenting on these lines and have produced experimental refractors which on test appear to be very satisfactory.

REGISTER OF PATENTS

Carburetted Water Gas Plant.—No. 319,769.

HUMPHREYS & GLASGOW, LTD., of Victoria Street, S.W. 1
(Assignees of H. G. TERZIAN, of Philadelphia).

No. 27,496; Sept. 10, 1929.

The following claims are made for this invention:

1. The process of producing a mixed oil gas and blue water gas by cracking oil gas with deposition of carbon in an ignited fuel bed, and generating blue water gas by air and steam blasting the said fuel bed, the deposited carbon being utilized in the production of gas partly by being burned to heat the fuel bed and partly by reaction with steam to form blue water gas, thus preventing excessive accumulation of carbon and keeping the fuel bed free and open for the passage of large volumes of gas and saving solid fuel.

2. In the process of producing a mixed oil gas and blue water gas according to claim 1, passing the oil gas and the air blast in the same direction through the fuel bed.

3. In the process of producing a mixed oil gas and blue water gas according to claim 1, passing the air blast and the oil gas upward through the fuel bed.

4. In the process of producing a mixed oil gas and blue water gas according to claim 1, passing the oil gas through the fuel bed alternately in one direction and then in the other direction between air blasting periods.

5. In the process of producing a mixed oil gas and blue water gas according to claim 1, reversing the air blast through the fuel bed, and between reversals of the air blast passing the oil gas through the bed in the direction of the preceding blast.

6. Apparatus for making mixed oil gas and blue water gas according to the process claimed in claim 1, including in combination a gas generator, means for blasting the fuel bed therein with air, means for steaming the fuel bed, and means for passing oil gas through the fuel bed in either direction.

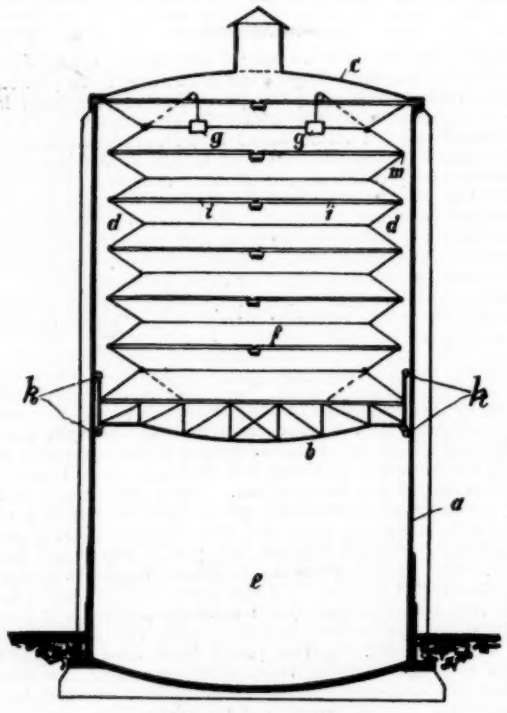
Waterless Holders.—No. 317,405.

MÜLLER, W., of Berlin, W. 57, Germany.

No. 24,940; Aug. 15, 1929. Convention date, Aug. 15, 1928.

The accompanying diagram is a vertical section of the holder.

The gas holder *a*, which is preferably constructed of ferro-concrete, has disposed therein a disc *b* provided with guide rollers *k* so as to be easily movable up and down. At the top the holder is closed by a cover *c*, and the disc is surmounted by a gas-tight envelope, the upper rim of which is clamped in a permanent gas-tight manner between



Müller's Dry Gasholder.

the cover and the holder. The disc can thus be raised and lowered without any packing being required between its periphery and the holder, the gas chamber *e* of the holder being shut off from the air space *f* above the disc *b* by the gas-tight envelope. The folding of the latter enables the disc to be adjusted to any desired level according to the amount of gas in the holder. During the ascent of the disc, the envelope is compressed in regular folds and opens out as the disc descends. When the holder is quite empty, the envelope is drawn out into an almost cylindrical shape.

The gas-tight envelope comprises a plurality of folding members *d* which are reinforced round their periphery by means of polygonal or annular stiffeners of light metal. These are reinforced in turn by cross-stays *i* which are connected together in star formation within the air space *f*. The stiffeners ensure that the gas-tight envelope expands and contracts in regular folds and in addition prevents the envelope from buckling under the pressure of the gas. For the purpose of further ensuring the gas-tightness of the folding members *d*, these members are connected together at their adjoining edges by flexible gussets.

In order to prevent distortion of the envelope at its point of attachment to the upper rim of the holder *a*, counter weights *g* are provided. Uneven loading of the disc by the envelope can also be more or less completely counteracted by counter weights attached to ropes passing through the cover *c* and guided on the outside of the holder. As will be apparent, the above-mentioned guide rollers *k* prevent the disc *b* from tilting or seizing against the wall of the holder *a*. The said guide rollers may, if desired, be replaced or used in conjunction with slides.

If the holder is constructed of concrete instead of metal plates, it can be completely made on the spot in a short time. In this respect, the holder differs from holders hitherto proposed, because in view of the packing required between the disc and the wall of the holder the latter has hitherto had to be carefully trued, and formed with a smooth surface. By our invention these precautions are now rendered unnecessary because an amount of play can be left between the disc and wall which, while it does not introduce any undesirable drawbacks, enables rough concrete to be used with satisfaction. Moreover, in the case of holders made of concrete, any leaky places can be repaired without interrupting the work of the holder.

The invention, states the patentee, is particularly applicable to holders for localities where the condition of the ground is uncertain, such as in mining and coastal districts, when subsidence has to be taken into consideration.

C.W.G. Production.—No. 329,246.

HUMPHREYS & GLASGOW, LTD., of 38, Victoria Street, Westminster
(Assignees of TERZIAN, H. G., of Philadelphia).

No. 27,628; Sept. 11, 1929. Convention date, Jan. 3, 1929.

It is the object of this invention to recover tar prior to the passage of the oil gas through the generator fuel bed as well as afterward, whereby a larger amount of tar may be recovered, and whereby, if desired, "the tar recovered prior to passage of the oil gas through the fuel bed, which is of better quality, may be segregated from that recovered after passage through the fuel bed."

No. 329,598.

HUMPHREYS & GLASGOW, LTD., of 38, Victoria Street, Westminster
(Assignees of HALL, E. L., of Philadelphia).

No. 27,626; Sept. 11, 1929. Convention date, Dec. 29, 1928.

The object of this invention is to provide a method whereby the oil vapours are provided with a carrying and protecting vehicle, but whereby the oil vaporization and subsequent cracking may be widely varied without a proportionate variation in water gas production, and without such a marked effect upon generator fire conditions.

Gas Producer Grates.—No. 329,776.

GIBBONS BROS., LTD., of Dudley (a communication from Dr. OTTO PISTORIUS, of Saarbruecken).

No. 10,958; April 9, 1929.

In accordance with this invention a conical grate for gas producers is provided, comprising a plurality of super-imposed rings which may be concentric or eccentric. A plurality of comparatively small nozzles are provided preferably inclining to the radii of the grate. The orifices may extend rearwardly and widen downwardly. Ribs may be disposed on the rings.

C.W. Gas Manufacture.—No. 331,138.

HUMPHREYS & GLASGOW, LTD., of Victoria Street, S.W. 1
(Assignees of H. G. TERZIAN, of Philadelphia).

No. 27,625; Sept. 11, 1929.

The following claims are made for this invention: A process for the manufacture of gas wherein all vapour or gas is simultaneously passed through a heated chamber and a hot fuel bed in parallel, thereby producing lightly cracked and heavily cracked oil gas, and steam is passed through the fuel bed for the production of water gas.

A process for the manufacture of gas which consists in air blasting a fuel bed and burning the products of combustion and storing the heat thereof in suitable apparatus, passing steam through the fuel bed to make water gas, introducing fluid hydrocarbon into the apparatus, and diverting a portion thereof through the fuel bed and a portion thereof through the apparatus, and simultaneously leading off partially cracked oil gas from the apparatus and more completely cracked oil gas from the fuel bed.

Geysers.—No. 330,417.

EWART, S., EWART, J. W., and EWART & SON, LTD., all of Euston Road, N.W. 1.

No. 19,419; June 24, 1929.

As it is often necessary to fit water heaters into the corners of rooms, it has previously been found that a heater in which the burner (say) is hinged on the right-hand side of the opening in the base is only adapted to fit in a corner formed by a pair of walls one of which is to the left of the opening and the other substantially parallel with or behind the opening.

The object of the invention is to construct a heater so that it can be adapted to fit in a corner formed as above, or in a corner formed by a pair of walls so that one of the walls is located to the right of the opening in the base of the heater while the other wall is substantially parallel with or behind the opening, the burner then requiring to be hinged to the left of the opening in the base.

The upper part of the heater is made separate from the intermediate part of the body, so that it can be moved round thereon together with the upright gas fitting, which is detachable from the base so that the fitting can be secured to the base on either side of the opening.

The burner is preferably of circular form with upstanding jets, and when the gas fitting is moved from one side of the opening in the base to the other side the burner is turned upside down on its feed tube, in order to bring the grating or door to the outside. The burner is then detached from the grating and turned over to bring its jets uppermost, and again attached to the grating, which is then in the right position to close the opening.

Lubrication of Meters.—No. 330,640.

SIMPSON, S., of Exmouth, and WILLEY & CO., LTD., of Exeter.

No. 8520; March 15, 1929.

The following claims are made for this invention:

1. An improvement in or modification of the invention described and claimed in Patent No. 282,964—see "JOURNAL," Vol. 181, p. 751—comprising an oil distributing reservoir divided into two or more compartments, each of which serves to supply oil to a particular working part or group of working parts of the meter mechanism, and a member in fixed relation to the reservoir and receiving oil from the oil storage tank and delivering it to the said compartments of the reservoir.

2. Means for the lubrication of dry gas meters as set forth in claim 1, wherein the supply of oil to the compartments of the oil distributing reservoir is effected by way of delivery orifices or the like, the cross-sectional area of which is determined according to the quantity of oil that is required to be delivered to any particular compartment.

3. Means for the lubrication of dry gas meters as set forth in claim 1 or 2, wherein the oil storage tank delivers oil into a trough or equivalent device, which trough is provided with the delivery orifices.

4. Means for the lubrication of dry gas meters as set forth in claim 1, 2, or 3, wherein the cross-sectional area of the delivery orifices or the like is capable of adjustment.

Meters.—No. 331,090.

METERS, LTD., of Manchester, and GLOVER, W. T., of Oldham.

No. 19,082; June 21, 1929.

This invention relates to gas and like meters of the Root's blower type, and has for its object to provide improved means for interconnecting the rotating lobed parts of the meter so as to prevent rubbing contact between the same, such means allowing of relative adjustment of the parts to suit working requirements.

The rotating lobed parts of the meter are geared to inter-connected shafts, and provision is made for a limited amount of angular adjustment of the shafts. This may be accomplished by coupling the shafts through two discs, one or both of which may have elongated slots therein through which the connecting bolts are passed. Preferably the drive to the inter-connected shafts is an irreversible one by means of a worm and worm wheel or spiral gears. The irreversible drives ensure that the one lobed part does not drive the other, but that the two parts must be rotated at the same rate so that they have a definite relationship to one another. If desired, the interconnected shafts may be driven by bevel gears from the lobed parts. The inter-connecting gearing may be arranged at either or at both ends of the lobed parts.

Applications for Patents.

[Extracted from the "Official Journal" for July 9.]

Nos. 17,760—20,473.

CLIMIE, W.—"Grates for gas producers." No. 20,275.
DONE, L.—"Gasholders." No. 19,984.
DUNLOP, J. E.—See Climie, W. No. 20,275.
EWART, J. W.—"Gas-ring mountings." No. 19,819.
GOLD, J. K.—"Domestic gas plant for waste vegetable products." No. 20,085.
HARMER, F. W.—"Means for securing diaphragms of gas meters." No. 19,903.
RAYBOULD, A.—"Pendant gas fittings." No. 20,035.
RUDOLPH, G.—See Done, L. No. 19,984.
SOUTH METROPOLITAN GAS COMPANY.—"Water, &c., heaters." No. 20,242.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Lords.

Private Bills.

The South Yorkshire and Derbyshire Gas Bill has been read a third time with amendments, passed, and returned to the Commons.

Special Orders.

The following Special Orders have been laid before the House and referred to the Special Orders Committee: Wolverhampton Gas Company; Bedford District Gas Company; Uxbridge, Maidenhead, and Wycombe Gas Company; Watford and St. Albans Gas Company; and Borough of Workington. The Special Orders Committee met on Tuesday of last week to consider the following Gas Orders: Colchester; Farnham; Tottenham and District.

House of Commons.

Private Bills.

The Lords amendments to the South Yorkshire and Derbyshire Gas Bill were considered and agreed to.

The Brixham Gas and Electricity Bill was a read a third time, and passed with amendments. The Hartlepool Gas and Water Bill has passed its second reading and has been referred to a Committee comprising Dr. John Williams (Chairman), Col. Fremantle, Mr. A. Somerville, and Mr. Lang.

The Ascot District Gas and Electricity Bill has been read a third time, and passed with amendments.

Special Orders.

The following Special Orders have been presented and ordered to lie upon the Table: Wolverhampton; Bedford; Uxbridge; Watford and St. Albans; Workington.

Institution of Chemical Engineers.

Examination Questions for Associate-Membership.

We have received from Prof. J. W. Hinckley, the Hon. Secretary of the Institution of Chemical Engineers, a copy of the papers for the Associate-Membership examination of the Institution this year. As on previous occasions, the candidates were entertained at dinner at the Chemical Industry Club, after which a *viva voce* examination was held.

To give our readers some idea of the questions set in the written examinations, the following have been selected:

1. Write a comprehensive essay on devices for control of temperature and pressure, with special reference to their applications in chemical manufacturing plant.

2. A conical vessel 8 ft. diameter at the top, terminating in a 2 in. diameter orifice at the bottom, and 12 ft. vertical height, measured from the orifice to the top, is full of water.

Find the time required to empty the vessel; also to lower the level from 12 ft. to 2 ft. Assume a coefficient of discharge of 0·9.

3. A non-viscous liquor is discharged under a pressure of the order of 10 to 20 lbs. per sq. in. from a short horizontal pipe 1½ in. diameter into a culvert situated some feet below.

How would you determine the quantity flowing in gallons per minute? It is not possible to measure the supply pressure.

4. State what you know of the laws governing the flow of gases and liquids in pipes of circular section.

What physical characteristics of a liquid or gas determine the loss of pressure in passing through a pipe?

What is understood by the expression "Reynolds' criterion" as applied to stream-line and turbulent flow?

Calculate the approximate critical velocity in a straight pipe, 5 cm. bore, for a fluid of density 0·9 and coefficient of viscosity (μ) in c.g.s. units 1·0.

5. What factors govern the rate of heat transfer in the following?

(*a*) Two liquids flowing in contraflow through a concentric tube heat exchanger.

(*b*) Two gases—*e.g.*, air and flue gases from a boiler, the air passing through circular tubes placed in a flue at right-angles to the flow of gas, the gas thus flowing across their outer surface.

(*c*) A bare steel pipe in which oil is flowing at a velocity of 4 ft. per sec. and a temperature of 300° C., exposed to the air at ordinary atmospheric temperature.

6. Describe what tests you would make to determine the efficiency of combustion in a boiler plant; also the instruments you would provide for the control of the installation.

A coal-fired boiler is discharging flue gas at 300° C. with a CO_2 content of 10 p.ct. Discuss what economies you would expect to obtain after providing improvements in the installation.

7. An absorption plant using activated carbon as the absorbent has to handle per hour 340 cub.m. of air which contains 4 p.ct. of benzene vapour. If this mixture enters the absorber at 20° C. and 780 mm. pressure, calculate the amount of heat which would have to be removed from the bed if the stripped air has to leave at 20° C. Take the heat of absorption as 200 cals. per gm. Sketch the type of cooler you would use, and give reasons for the type selected.

8. Write a short essay on "Factory Effluents and their Treatment," choosing a typical example from your experience as illustration.

9. Explain clearly what you understand from the following terms: Limited company, cumulative preference shares, debentures, underwriting, preliminary expenses, prospectus, issuing house.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

The fortnightly Account on the Stock Exchange closed on Friday last with dull conditions in most markets. Even British Funds (which have been a tower of strength for some time past) were weak, and lost ground during the week.

As we pointed out a few weeks ago, Gas Stocks and Shares have been little affected by the general depression and have remained tranquil. There were few changes in the quotations, but those recorded were in an upward direction. Gas Light £1 units, following the gain of 3d. the previous week, rose a further 1½d. to 19s. 4½d; Bristol 5 p.ct. maximum (at the local Exchange) strengthened 1 point to 90½; Commercial ordinary advanced to 95½, a rise of 4 points; and Primitiva 4 p.ct. consolidated debenture gained 1 to 81½. Swansea 7 p.ct. preference and 6⅔ p.ct. debenture recorded fractional increases. It will be noticed from the Stock and Share List that the ordinary capital of the European Company is now quoted at per £100 stock, the first quotation being 115. This is in accordance with a resolution passed at an Extraordinary Meeting of the Company held in March last authorizing the conversion of the then existing £10 shares into stock. The stock is transferable in units and multiples of one pound.

The proposed terms of the amalgamation of the Southend-on-Sea and District Gas Company with the Gas Light and Coke Company, which is to take effect on Jan. 1, 1932, have now come to hand, and provide *inter alia* for an exchange of stocks on a basis, the terms of which are set out in the "News of the Week" column of this week's "JOURNAL." The Directors of the Commercial Gas Company have declared a dividend of 3 p.ct. for the past half-year, of which ½ p.ct. is in respect of surplus profits hitherto distributed at the end of the year. For the corresponding period of 1929 the rate was 2½ p.ct. The Directors of the Gas Light and Coke Company have declared dividends for the half-year ended June 30 last as follows: On the 4 p.ct. consolidated preference stock at the rate of £4 p.ct. per annum; on the 3½ p.ct. maximum stock at the rate of £3 10s. p.ct. per annum; on the ordinary stock at the rate of £5 12s. p.ct. per annum.

Interim dividends announced last week were: Tottenham and District Gas Company, 6⅝ p.ct. per annum; and Newcastle and Gateshead Gas Company, 5 p.ct. per annum. The rates in both cases are the same as a year ago.

Coal Markets.

Week by week the markets remain in the depths of depression, and there is at present no sign whatever of any improvement in the position. Changes in the coal trade, when they do come, are usually sudden and unlooked-for, and collieries, merchants, and exporters can only console themselves to-day with the hope that some such change will come in the autumn. So little coal is being taken at present that it seems the excessive stocks, which are largely responsible for the slackness, must be suffering reduction. But even when the time comes, keener competition than ever is anticipated, as far as export is concerned.

In the meantime conditions in the coal areas are worse than for a long time past. Pits are being closed, and more and more men are receiving their notices. New business is at a standstill, and there is often great difficulty in getting coal taken out under the contracts upon which the collieries are existing.

There is little change in quotations, as prices are now right down to, or below, the cost of production, and it is felt that even further reductions would not fetch new business. Wear specials quote 15s. 3d. to 15s. 6d. f.o.b., and best Durham gas 14s. 9d. to 15s. Durham seconds are 12s. 9d. to 13s.

Gas coke remains steady at about the recent figure of 21s. 6d.

Contracts Advertised To-Day.

Coal.

The Gas Committee of the Sutton-in-Ashfield Urban District Council invite tenders for the supply of coal. [Advert. on p. 216.]

Pipes and Specials.

The Milford Haven Urban District Council invite tenders for the supply of gas and water mains and specials. [Advert. on p. 216.]

Retorts.

The Milford Haven Urban District Council invite tenders for the re-setting of horizontal retorts. [Advert. on p. 216.]

Stoking and Discharging Machine.

The Gas Committee of the Skipton Urban District Council invite tenders for the supply of a combined stoking and discharging machine. [Advert. on p. 216.]

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 21.

There are no changes to report in the prices of tar products during the past week.

Pitch is 47s. 6d. per ton f.o.b.

Creosote for export is 6d. to 6¼d. per gallon f.o.b.

White spirits are steady, pure toluole being 2s. 2d. to 2s. 3d.; pure benzole, 1s. 10d. to 1s. 11d.; and 95/160 solvent naphtha, 1s. 5d. to 1s. 6d., all per gallon. Pyridine bases remain at about 3s. 9d. per gallon—all these prices being *ex* sellers' works.

Tar Products in the Provinces.

July 21.

The average prices of gas-works products during the week were: Gas-works tar, 20s. to 24s. Pitch—East Coast, 46s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 46s. f.o.b.* Toluole, naked, North, 1s. 7¼d. to 1s. 8¼d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3½d. to 3¾d.; low gravity, 1½d.; Scotland, 3½d. to 3¾d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. to 2s. 1d. July/December. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum, 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *July* 19.

Owing to the holidays there is no change to report in market conditions in this area. Very few orders have been placed, and prices are weak generally.

Pitch.—Prices are nominal at 47s. 6d. per ton f.o.b. Glasgow for export and about 47s. 6d. per ton *ex* works for the home market.

Tar.—The distillers have been busy anticipating requirements. Price remains steady at 3¼d. to 3¾d. per gallon f.o.r. works in buyers' packages.

Creosote.—Values are unaltered. B.E.S.A. specification, 3½d. to 4d. per gallon; low gravity, 3d. to 3½d. per gallon; neutral oil, 3d. to 3½d. per gallon—all *ex* makers' works in bulk.

Cresylic.—Very few orders are passing either for home or for export. Pale 97/99 p.ct. is 1s. 8d. to 1s. 9d. per gallon; dark 97/99 p.ct., 1s 7d. to 1s. 8d. per gallon; pale 99/100 p.ct., 1s. 10d. to 1s. 11d. per gallon—all f.o.r.

Crude naphtha is unchanged at about 4¼d. to 4¾d. per gallon free on rails works.

Solvent naphtha is quiet with values easy at 1s. 2½d. to 1s. 3½d. per gallon for 90/160 quality and 1s. to 1s. 1d. per gallon for 90/190 quality.

Motor benzole.—The value remains steady at 1s. 6¼d. to 1s. 6¾d. per gallon.

Pyridines are very dull. 90/160 grade is about 3s. to 3s. 3d. per gallon.

Benzole Prices.

The following are considered to be the market prices at the present time:

	s. d.	s. d.	
Crude benzole	0 10	to 0 11	per gallon at works
Motor ,,	1 5½	,, 1 6½	,, ,,
Pure ,,	1 10	,, 1 11	,, ,,

Trade Notes.

The Jeffrey-Diamond Single-Roll Crusher.

A folder recently issued by British Jeffrey-Diamond, Ltd., of Stennard Works, Wakefield, describes the design and operation of the firm's single-roll crusher, which was featured in the "JOURNAL" for May 7 last, p. 300.

A New "Metro-Vic" Depôt.

A new depôt at Mervyn House, Frederick Street, Cardiff, has been opened by Metropolitan-Vickers Electrical Company, Ltd., for the sale of their "Cosmos" lamps in the Cardiff district. Sales in the Swansea area will be conducted from the Company's existing offices at 62, Wind Street, Swansea

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 18.	Rise or Fall on Week.	Transact'ns Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 6	5	5	Aldershot 5 p.c. max. C. .	73—78	..	..
522,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	70—73	..	..
1,551,868	,,	Apl. 3	7½	7½	Alliance & Dublin Ord. . .	93—96	..	..
374,000	,,	July 10	4	4	Do. 4 p.c. Deb. . . .	60—63*	..	..
522,655	,,	Mar. 6	7	7	Barnet Ord. 7 p.c.	109—113	..	..
800,000	1	Apl. 24	1/4½	1/7½	Bombay, Ltd.	16/- - 18/-	..	17/-
174,500	10	Mar. 6	9	9	Bournemouth 5 p.c.	14—15	..	..
500,050	10	,,	7	7	Do. B 7 p.c. . . .	12½—12⅝	..	..
439,160	10	,,	6	6	Do. Pref. 6 p.c. . .	10⅝—11¼	..	..
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb. . .	54—57	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb. . .	72—75	..	..
357,900	,,	Mar. 20	7½	7½	Brighton & Hove 6 p.c. Con.	114—117	..	115½—116½
871,880	,,	,,	6⅝	6⅝	Do. 5 p.c. Con.	102—105	..	..
1,287,500	,,	Feb. 20	5	5	Bristol 5 p.c. max.	90—91*a*	+1	..
855,000	,,	Apl. 3	7	8	British Ord.	110—115	..	..
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	112—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. . .	70—73	..	73
450 000	,,	,,	5	5	Do. 5 p.c. Red. Deb. . .	90—93	..	..
100,000	,,	June 26	5	5	Cambridge 5 p.c. Deb. . .	93—96	..	94
100.000	10	May 22	6	10	Cape Town, Ltd.	9—10	..	..
100.000	10	Apl. 24	4½	4½	Do. 4½ p.c. Pref. . .	6½—7½	..	..
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. . .	69—74	..	..
626.860	,,	Feb. 20	6	6	Cardiff Con. Ord.	96—99	..	..
237.860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb. .	97—100	..	..
157,150	,,	Feb. 20	5	6½	Chester 5 p.c. Ord.	88—93*b*	..	..
98,936	1	May 8	†2/-	†2/-	Colombo, Ltd. Ord. . . .	33/—35/-	..	..
24.500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref. .	18/6—20/6	..	..
375,402	1	Apl. 3	1/9½	1/9½	Colonial Gas Assn. Ld. Ord	18/—20/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	19/—21/-	..	..
2,073,280	Stk.	Feb. 20	5	7	Commercial Ord.	94—97	+4	95
475,000	,,	June 26	3	3	Do. 3 p.c. Deb. . .	56—59	..	..
787,560	,,	Feb. 20	7	7	Croydon sliding scale . .	105—108	..	107—108
453,100	,,	,,	5	5	Do. max. div. . . .	83—86	..	83½—85
542 270	,,	Mar. 6	7	10	Derby Con.	115—125*e*	..	..
55,000	,,	June 26	4	4	Do. Deb.	65—70*e*	..	..
209,000	,,	Mar. 6	5	5	East Hull Ord. 5 p.c. . . .	71—73	..	..
1.002,180	,,	Mar. 20	†4	†7	European, Ltd.	110—120	..	110
18,629,125	,,	Feb. 20	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	19/1½—19/7½/	+-/1½	19/1½—19/7½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	63½—65½	..	63½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. . .	77—80	..	78—79½
5,602,620	,,	June 26	3	3	Do. 3 p.c. Con. Deb. . .	58—61	..	59
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. . .	97—100	..	98½—100
161,480	,,	Feb. 20	10	10	Harrogate Cons. 10 p.c. max.	158—163	..	..
82,500	,,	Mar. 20	7	7	Hastings & St. L. 5 p.c. Conv.	99—104	..	102½—103
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	78—83	..	..
70 000	10	May 22	†10	§	Hongkong & China, Ltd. .	13½—14½	..	..
213,200	Stk.	Mar. 6	6	6	Hornsey Con. 3½ p.c. . . .	90—93	..	..
2,436,594	,,	May 22	10	25	Imperial Continental Cap. .	340—360	..	343—349
228,180	,,	Feb. 6	3½	3½	Do. 3½ p.c. Red. Deb.	80—85	..	..
235,242	,,	Mar. 20	8½	8½	Lea Bridge 5 p.c. Ord. . .	123—128	..	..
2,145,907	,,	Feb. 20	6	6	Liverpool 5 p.c. Ord. . . .	92—93*b*	..	..
600 000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref. .	100—102*b*	..	..
165,736	,,	Feb. 20	9	8	Maidstone 5 p.c. Cap. . .	119—124	..	..
63,480	,,	June 26	3	3	Do. 3 p.c. Deb. . .	51—54	..	..
75,000	5	June 26	†10	†10	Malta & Mediterranean . .	5½—6	..	..
392,000	—	Apl. 1	5½	5½	Metrop'itan (of Melbourne) 5½ p.c. Red. Deb. . . .	90—93	..	..
541,920	Stk.	May 22	†6	†8	Montevideo, Ltd.	105—110	..	..
2,061,315	,,	Feb. 20	5	5½	Newcastle & Gateshead Con.	16/—16/9*d*	..	..
682.856	,,	,,	4	4	Do. 4 p.c. Pref. .	72—73*d*	..	..
691,705	,,	Dec. 19	3½	3½	Do. 3½ p.c. Deb. .	66⅔—67⅔*d*	..	..
169,940	,,	Mar. 6	7½	7½	North Middlesex 6 p.c. Con.	109—114	..	..
396,160	,,	Feb. 6	5	5	Northampton 5 p.c. max. .	75—78	..	..
300 000	,,	Apl. 24	9	7	Oriental, Ltd.	108—113	..	..
60.000	5	13 My., '15	—	—	Ottoman	0—¼	..	..
205,162	Stk.	June 26	8	8	Plym'th & Stonehouse 5 p.c.	105 108	..	..
424,416	,,	Feb. 20	8	8	Portsm'th Con. Stk. 4 p.c. Std	110—115	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max. . .	78—81	..	..
186,000	100	June 2	4	4	Primitiva 4 p.c. Red. Deb. .	96—99	..	..
677,837	Stk.	Jan. 23	4	4	Do. 4 p.c. Red. Deb. 1911	81—84	..	..
371,496	,,	June 26	4	4	Do. 4 p.c. Cons. Deb. .	80—83	+1	..
150,000	10	Apl. 3	6	6	San Paulo 6 p.c. Pref. . .	8½—9	..	..
1,736 968	Stk.	Mar. 20	6½	6½	Sheffield Cons.	103—105*e*	..	..
95,000	,,	July 10	4	4	Do. 4 p.c. Deb.	76—78*e**	..	..
90 000	10	June 5	†4	‡	South African	4—6	..	..
6 709.895	Stk.	Feb. 20	5	7½	South Met. Ord.	102—104	..	102⅝—103⅝
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	108—111	..	..
1,895.445	,,	July 10	3	3	Do. 3 p.c. Deb. . .	57—60*	..	..
734,000	,,	Mar. 6	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	..
91.500	,,	Mar. 20	8½	8½	South Shields Con. . . .	106½—107½*d*	..	..
1,543,795	,,	Feb. 20	6½	6½	South Suburban Ord. 5 p.c.	101—104	..	102½
468,837	,,	June 26	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Feb. 20	5	5	Southampton Ord. 5 p.c. max.	76—79	..	..
121.375	,,	June 26	4	4	Do. 4 p.c. Deb.	71—74	..	..
179,014	,,	Feb. 20	8	8	Sutton Ord.	113—116	..	..
67,828	,,	June 26	5	5	Do. 5 p.c. Deb. . . .	93—96	..	..
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref. .	98—101	+½	99½
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb. .	98—101	+½	100
1,076,490	,,	Mar. 6	6⅝	6⅝	Tottenham District Ord. .	102 106	..	103—104
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. . .	97—100	..	..
199,005	,,	June 26	4	4	Do. 4 p.c. Deb. . .	73—76	..	..
182,380	10	30 Dec., '12	—	—	Tuscan, Ltd.	3⅜—4⅜	..	..
85,701	Stk.	Mar. 20	6	6	Do. 6 p.c. Red. Deb.	75—80	..	..
309,094	,,	Mar. 6	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	94—99	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. . .	85—90	..	89½
1,180,970	,,	July 10	—	7	Wandsworth, Wimbledon, and Epsom Cons. . .	105—110*	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—90*	..	..
488,344	,,	June 26	5	5	Do. 5 p.c. Deb.	93—96	..	95—95½

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With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

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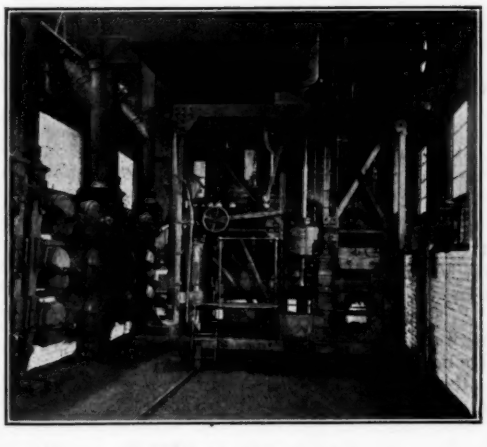

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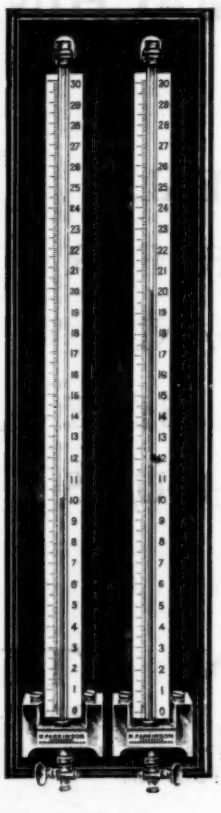

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